



Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

GCSE

CHEMISTRY

Foundation Tier Paper 2

8462/2F

F

Wednesday 13 June 2018 Morning

Time allowed: 1 hour 45 minutes

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]



For this paper you must have:

- **a ruler**
- **a scientific calculator**
- **the periodic table (enclosed).**

INSTRUCTIONS

- **Use black ink or black ball-point pen.**
- **Answer ALL questions in the spaces provided.**
- **Do all rough work in this book. Cross through any work you do not want to be marked.**
- **In all calculations, show clearly how you work out your answer.**



INFORMATION

- **There are 100 marks available on this paper.**
- **The marks for questions are shown in brackets.**
- **You are expected to use a calculator where appropriate.**
- **You are reminded of the need for good English and clear presentation in your answers.**

DO NOT TURN OVER UNTIL TOLD TO DO SO



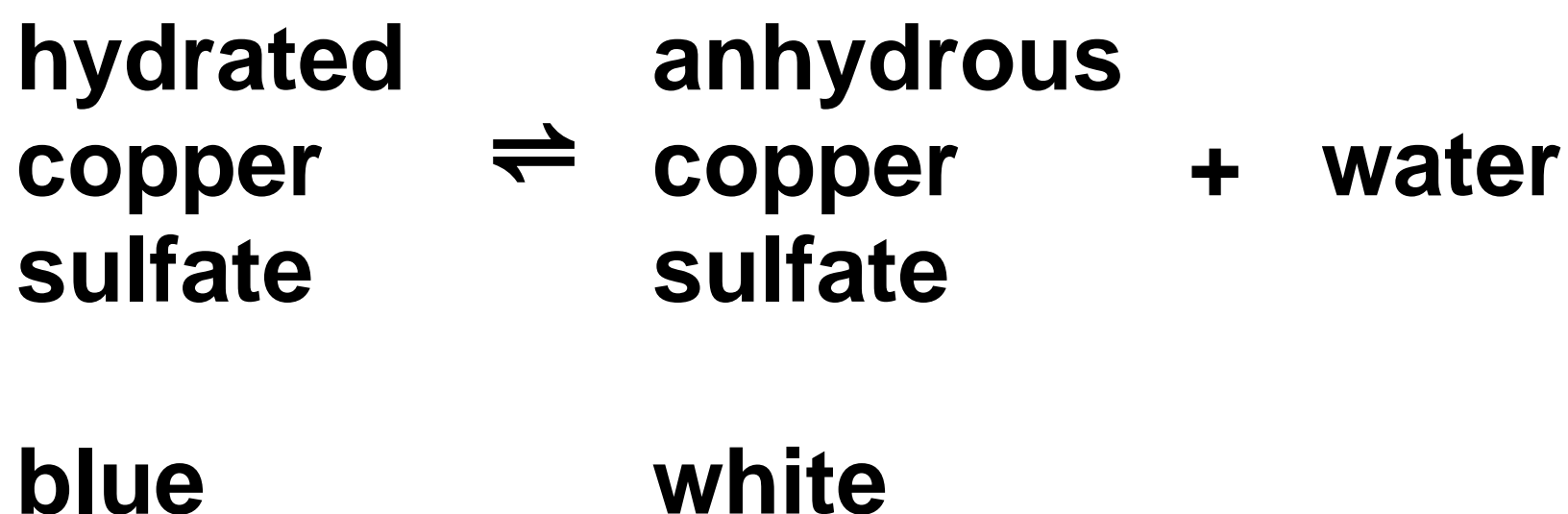
4

0	1
---	---

This question is about copper sulfate.

Blue copper sulfate turns white when it is heated.

The word equation for the reaction is:



5

0 1 . 1 What name is given to hydrated copper sulfate in this reaction?

Tick ONE box. [1 mark]

Catalyst

Element

Product

Reactant

[Turn over]



6

01.2 What does the symbol \rightleftharpoons mean?

Tick ONE box. [1 mark]

Endothermic

Exothermic

Reversible

Polymerisation

01.3 Complete the sentence. [1 mark]

The colour change when water is added to anhydrous copper sulfate is white to _____.



7

A student heats 2.5 g of hydrated copper sulfate in a test tube.

0.9 g of water is given off.

The remaining solid is anhydrous copper sulfate.

0 1 . 4 Calculate the mass of anhydrous copper sulfate produced.
[1 mark]

Mass of anhydrous copper sulfate = _____ g

[Turn over]



8

01.5 Calculate the percentage of water contained in 2.5 g of hydrated copper sulfate. [2 marks]

Percentage of water = _____ %



0 1 . 6 Draw ONE line from each compound to the formula for the compound. [2 marks]

Compound

Formula for the compound

Copper sulfate

CuO

CuS

CuSO₄

Water

H₂O

H₂SO₄

[Turn over]

8



0 2

This question is about fuels.

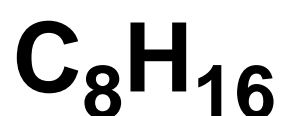
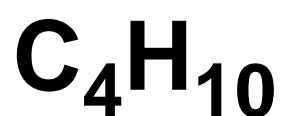
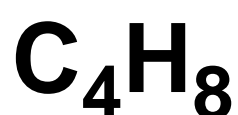
Octane (C_8H_{18}) is a hydrocarbon in petrol.

0 2 . 1

Cracking breaks down large hydrocarbon molecules into smaller hydrocarbon molecules.

Which hydrocarbon molecule can be cracked to produce octane, C_8H_{18} ?

Tick ONE box. [1 mark]



0 2 . 2 What type of carbon compound is octane, C_8H_{18} ?

Tick ONE box. [1 mark]

Alcohol

Alkane

Carboxylic acid

Ester

0 2 . 3 Oxygen is needed to burn fuels.

Name the source of the oxygen needed to burn fuels. [1 mark]

[Turn over]



02.4 Particulates and sulfur dioxide are pollutants produced when some fuels burn.

Draw **ONE** line from each pollutant to the polluting effect.
[2 marks]

Pollutant

Polluting effect

Acid rain

Particulates

Global dimming

Global warming

Sulfur dioxide

Landfill

Sewage sludge



0 2 . 5 Which TWO gases are produced when fuels burn in car engines?

Tick TWO boxes. [2 marks]

Ammonia

Carbon dioxide

Carbon monoxide

Nitrogen

Oxygen

[Turn over]



0 2 . 6 Vehicles produce most of the atmospheric pollution in cities.

How could the atmospheric pollution in cities be reduced?

Tick TWO boxes. [2 marks]

Build more roads in cities

Build new car factories

Develop fuel efficient engines

Make car tax cheaper

Use electric cars

9



BLANK PAGE

[Turn over]



03 Polymers are used to make fabrics.

TABLE 1 shows some properties of two polymers.

TABLE 1

Property	Polymer J	Polymer K
Density in g/cm³	0.9	1.4
Melting point in °C	165	260
Flame resistance	Poor	Good
Water absorption	Low	High

03.1 Polymer fabrics are used to make firefighter uniforms.

Complete TABLE 2 by deciding for each property whether polymer J or polymer K is **BEST** for firefighter uniforms.

Use TABLE 1, on page 16.

Density has been completed for you.

Tick **THREE** boxes. [2 marks]

TABLE 2

Property	Polymer J	Polymer K
Density in g/cm ³	✓	
Melting point in °C		
Flame resistance		
Water absorption		

[Turn over]



Repeat of TABLE 1

Property	Polymer J	Polymer K
Density in g/cm³	0.9	1.4
Melting point in °C	165	260
Flame resistance	Poor	Good
Water absorption	Low	High

03.2 A firefighter uniform made from polymer J has a mass of 6.0 kg



19

Calculate the mass of a uniform of the same size made from polymer K.

**Use TABLE 1 and the equation:
mass of uniform made from
polymer K =**

$$\frac{\text{density of polymer K}}{\text{density of polymer J}} \times 6.0$$

[2 marks]

**Mass of uniform made from
polymer K =**

_____ **kg**

[Turn over]



0 3 . 3 Polymers J and K are both thermosoftening polymers.

Polymer L is a thermosetting polymer.

Why would polymer L be better than polymers J and K for firefighter uniforms?

Tick ONE box. [1 mark]

Polymer L burns easily

Polymer L does not biodegrade

Polymer L will not melt



21

Polymers J and K are made from crude oil.

In the past, firefighter uniforms were made from wool.

Wool is obtained from sheep.

0 3 . 4 Why are many fabrics made from polymers instead of wool?

Tick ONE box. [1 mark]

Polymers are man-made

Polymers are more hard-wearing

Wool is more easily available

Wool is more flame resistant

[Turn over]



BLANK PAGE



03.5 Why is wool more sustainable than polymers J and K for making firefighter uniforms?
[2 marks]

[Turn over]

8



0 4

A 9 carat gold ring is made from a mixture of metals.

TABLE 3 shows the mass of different metals in the ring.

The mass of the ring is 5.0 g

TABLE 3

Metal	Mass of metal in g
Gold	1.9
Silver	2.8
Copper	0.3

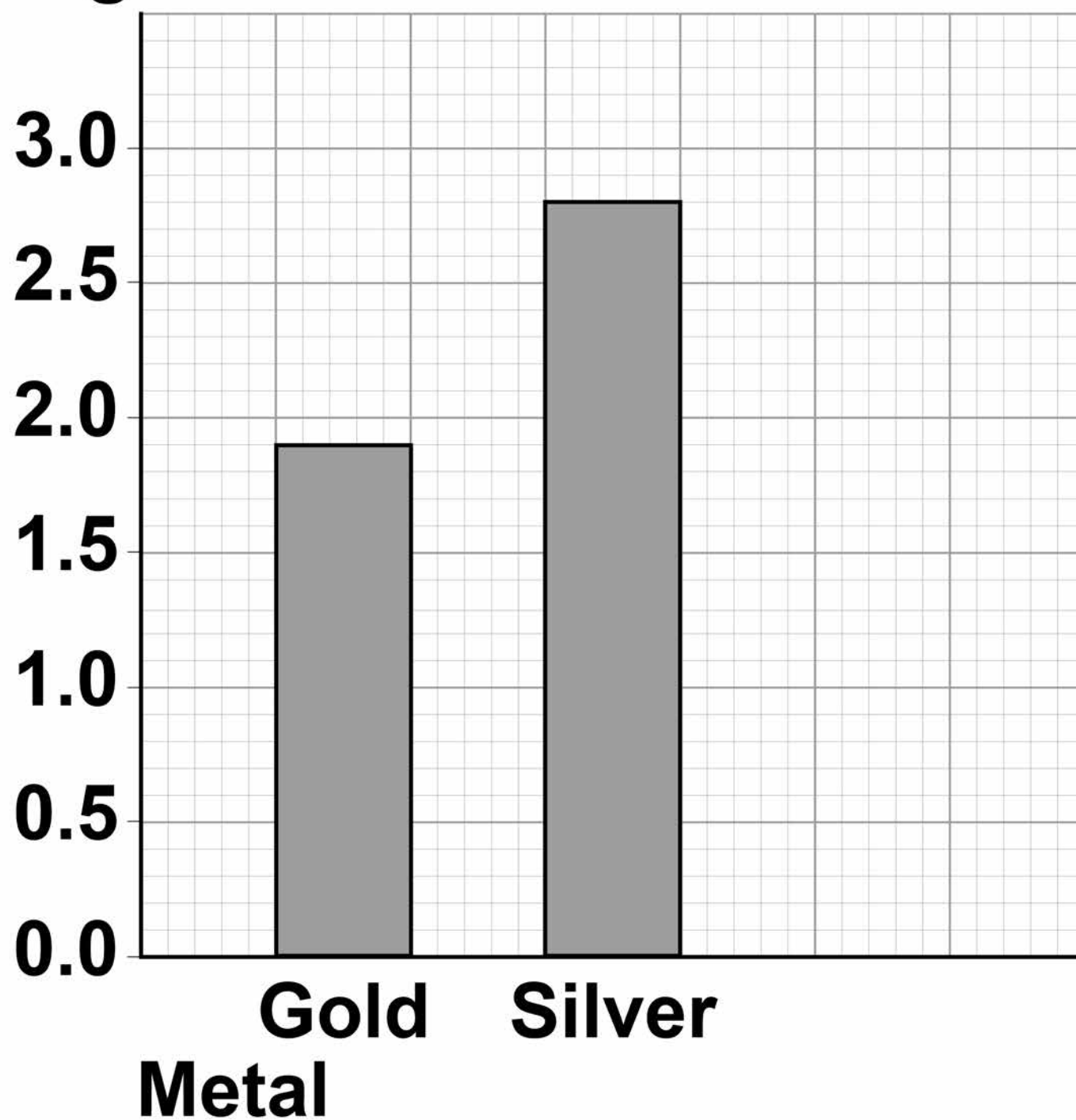


25

04.1 Plot the data for copper from **TABLE 3** on **FIGURE 1**. [2 marks]

FIGURE 1

**Mass
of metal
in g**



[Turn over]



Repeat of TABLE 3

Metal	Mass of metal in g
Gold	1.9
Silver	2.8
Copper	0.3

0 4 . 2 The cost of gold is £30 per gram.

Calculate the cost of the gold used in the 9 carat gold ring.

Use TABLE 3. [1 mark]

Cost of gold = £ _____



27

04.3 Rings can be made from 22 carat gold.

The ratio of the mass of gold in 22 carat gold compared to 9 carat gold is 22 : 9

Calculate the mass of gold in a 22 carat gold ring of mass 5.0 g

Use TABLE 3. [2 marks]

Mass of gold = _____ g

[Turn over]



0 4 . 4 Pure gold is 24 carat.

Suggest TWO reasons why silver and copper are mixed with gold to make 9 carat gold rings. [2 marks]

1

2

0 4 . 5 Copper is obtained from copper ores or by recycling copper.

- **Copper ores are non-renewable.**
- **Copper ores can be obtained by mining.**
- **Some scrap copper goes to landfill sites.**



29

Give THREE reasons why we should use recycled copper instead of copper from copper ores. [3 marks]

1

2

3

[Turn over]

10



0	5
---	---

A student investigated the colours in three different flowers, A, B and C, using paper chromatography.

The colours are soluble in ethanol but are insoluble in water.

This is the method used.

- 1. Place ethanol in a beaker.**
- 2. Add the flower.**
- 3. Stir until the colours dissolve in the ethanol.**
- 4. Filter the mixture.**
- 5. Put spots of the coloured filtrate on the chromatography paper.**



31

0 5 . 1 The filtrate was a very pale coloured solution.

How could the student obtain a darker coloured solution?

Tick TWO boxes. [2 marks]

Crush the flower

Filter the mixture three times

Use a larger beaker

Use more ethanol

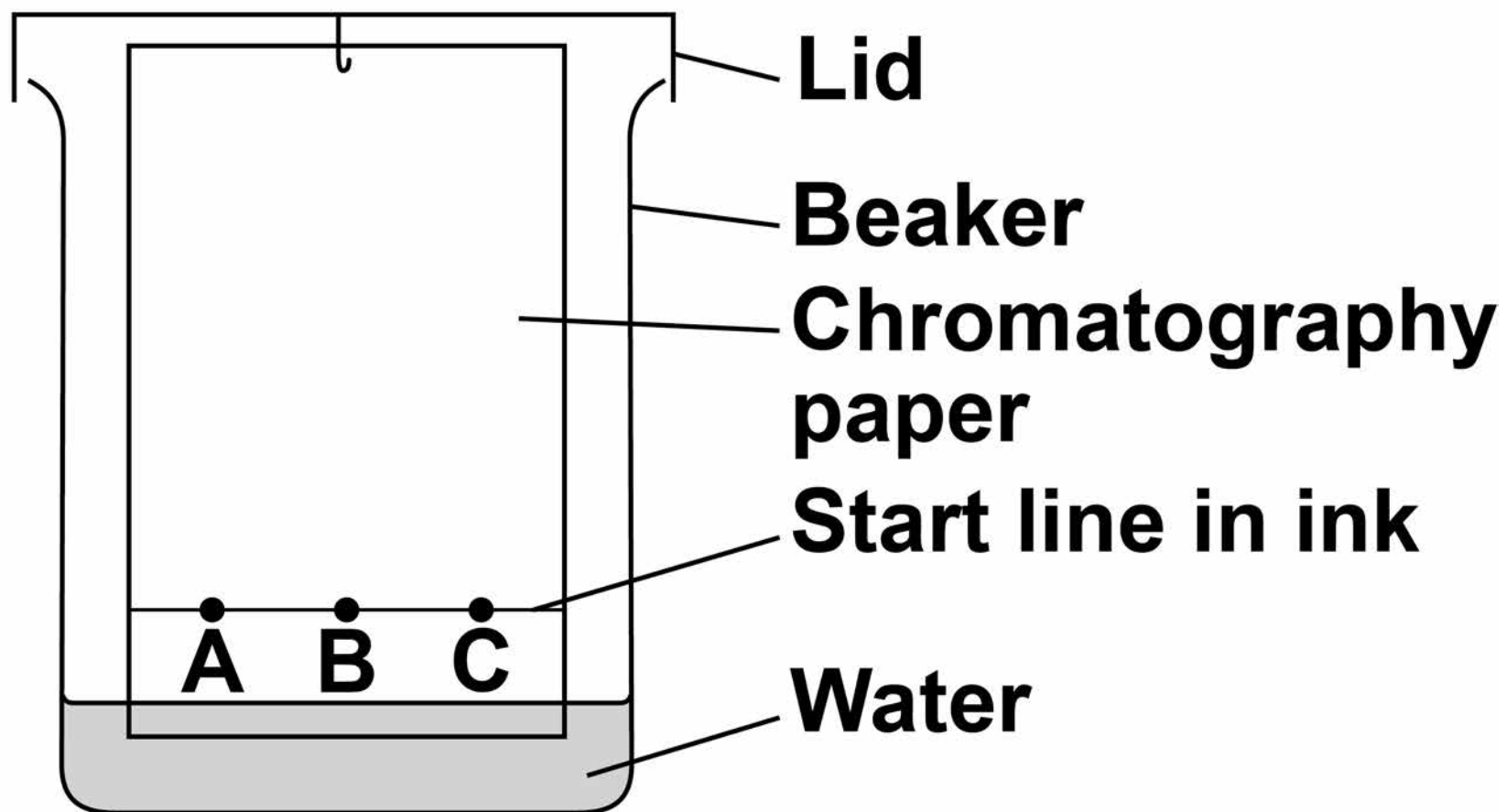
Use more flowers

[Turn over]



05.2 FIGURE 2 shows the apparatus used.

FIGURE 2



33

What TWO mistakes did the student make in setting up the apparatus?

Tick TWO boxes. [2 marks]

The paper does not touch the beaker

The start line is drawn in ink

The water level is below the start line

Uses a lid on the beaker

Uses water as the solvent

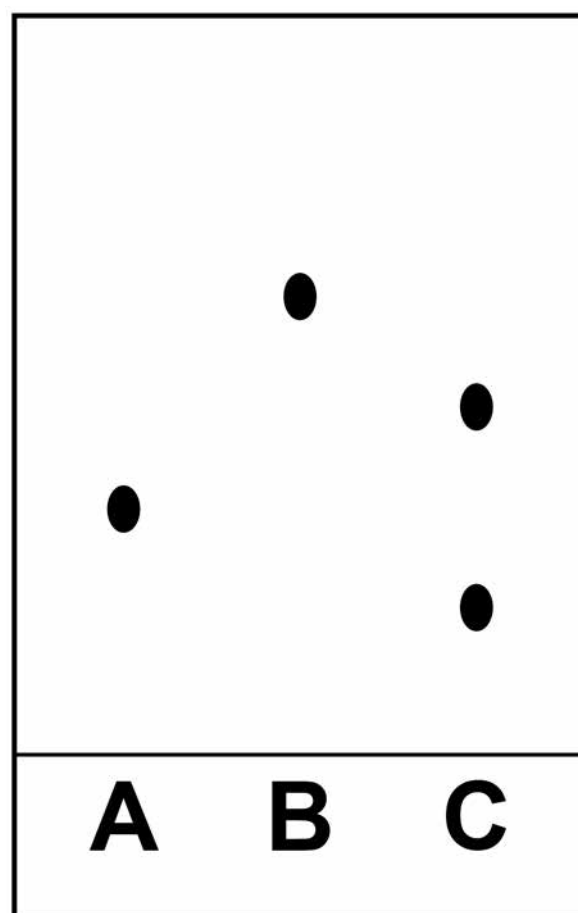
[Turn over]



05.3 Another student sets up the apparatus correctly.

FIGURE 3 represents the student's results.

FIGURE 3



35

What TWO conclusions can be made from FIGURE 3?

Tick TWO boxes. [2 marks]

Flower A contains a single pure colour

Flowers A and B contain the same colours

The colour in flower C is a mixture

The colour in flower B was the least soluble

Two of the colours have the same R_f value

[Turn over]



36

05.4 The student records some measurements.

The measurements are:

- the colour from flower B moves 7.2 cm
- the solvent moves 9.0 cm

Calculate the R_f value for the colour from flower B.

Use the equation:

$$R_f = \frac{\text{distance moved by colour}}{\text{distance moved by solvent}}$$

[2 marks]

R_f value = _____

8



BLANK PAGE

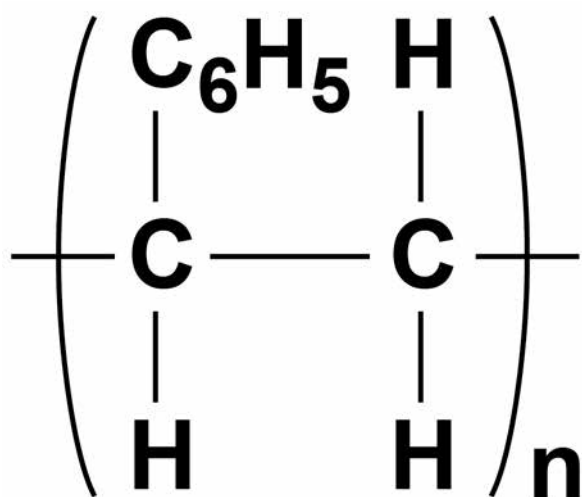
[Turn over]



0 6 Disposable cups are made from coated paper or poly(styrene).

FIGURE 4 represents the structure of poly(styrene).

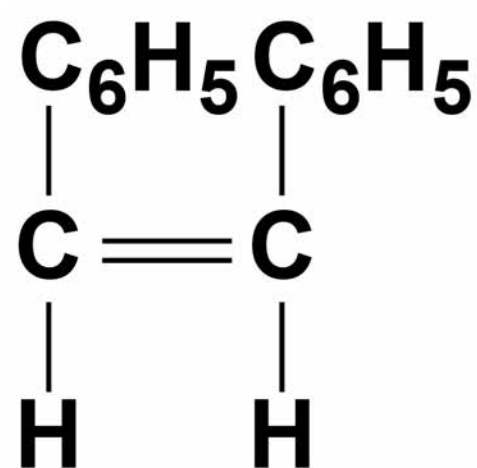
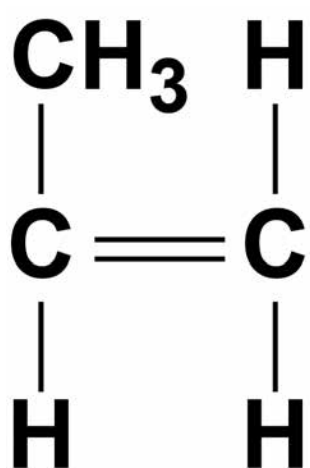
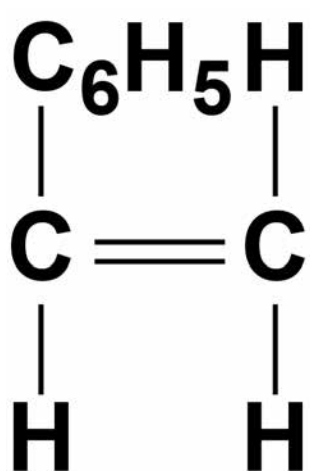
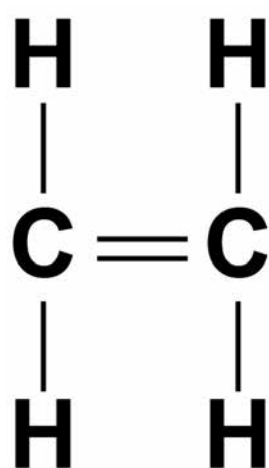
FIGURE 4



0 6 . 1 Which small molecule is used to produce poly(styrene)?

39

Tick ONE box. [1 mark]



[Turn over]



06.2 Which process is used to make poly(styrene) from small molecules?

Tick ONE box. [1 mark]

Cracking

Distillation

Fermentation

Polymerisation



41

06.3 Complete the sentences.

Choose answers from the list below. [3 marks]

- **ceramics**
- **composites**
- **four**
- **many**
- **monomers**
- **polymers**
- **two**

Poly(styrene) is produced from small molecules called

_____ .

When poly(styrene) is made,

_____ **styrene molecules join to form large molecules.**

These large molecules are called

_____ .



[Turn over]

06.4 TABLE 4 gives some information about disposable cups.

TABLE 4

	Coated paper cups	Poly(styrene) cups
Source of raw materials	Wood	Crude oil
Energy to make 1 cup in arbitrary units	550	200
Biodegradable	Yes	No
Recyclable	No	Yes

Compare the advantages and disadvantages of using coated paper and poly(styrene) to make disposable cups.

**Use TABLE 4 and your knowledge and understanding of life cycle assessments (LCAs).
[4 marks]**



07

A student investigated how concentration affects the rate of reaction between magnesium and hydrochloric acid.

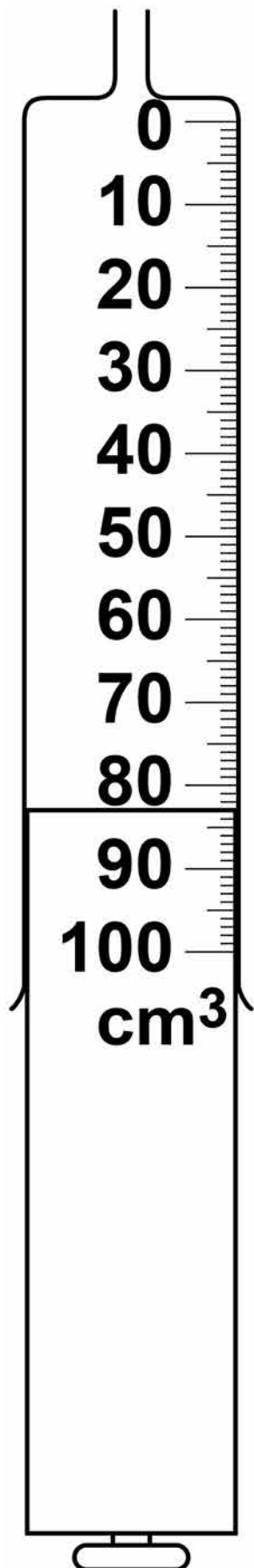
This is the method used.

- 1. Place hydrochloric acid in a conical flask.**
- 2. Add magnesium powder.**
- 3. Collect the gas produced in a gas syringe.**
- 4. Measure the volume of gas every 40 seconds for 160 seconds.**
- 5. Repeat steps 1–4 three more times.**
- 6. Repeat steps 1–5 with hydrochloric acid of a higher concentration.**



07.1 FIGURE 5 shows a gas syringe.

FIGURE 5



What is the volume of gas in the syringe? [1 mark]

Volume = _____ cm³

[Turn over]



BLANK PAGE



07.2 Which TWO variables should the student keep the same to make the investigation a fair test?

Tick TWO boxes. [2 marks]

Concentration of hydrochloric acid

Mass of magnesium powder

Temperature of hydrochloric acid

Time for reaction to end

Volume of gas collected

[Turn over]



TABLE 5 shows the student's results for the experiment with hydrochloric acid of a lower concentration.

TABLE 5

Time in seconds	Volume of gas collected in cm ³				
	Test 1	Test 2	Test 3	Test 4	Mean
0	0	0	0	0	0
40	46	30	47	49	X
80	78	83	83	82	82
120	98	94	96	95	96
160	100	100	100	100	100



07.3 Calculate mean value X in TABLE 5.

Do NOT include the anomalous result in your calculation.

Give your answer to 2 significant figures. [2 marks]

$X =$ _____ cm^3

[Turn over]



Repeat of TABLE 5

Time in seconds	Volume of gas collected in cm ³				
	Test 1	Test 2	Test 3	Test 4	Mean
0	0	0	0	0	0
40	46	30	47	49	X
80	78	83	83	82	82
120	98	94	96	95	96
160	100	100	100	100	100

07.4 Plot the data from TABLE 5 on FIGURE 6.

You should include your answer to Question 07.3.

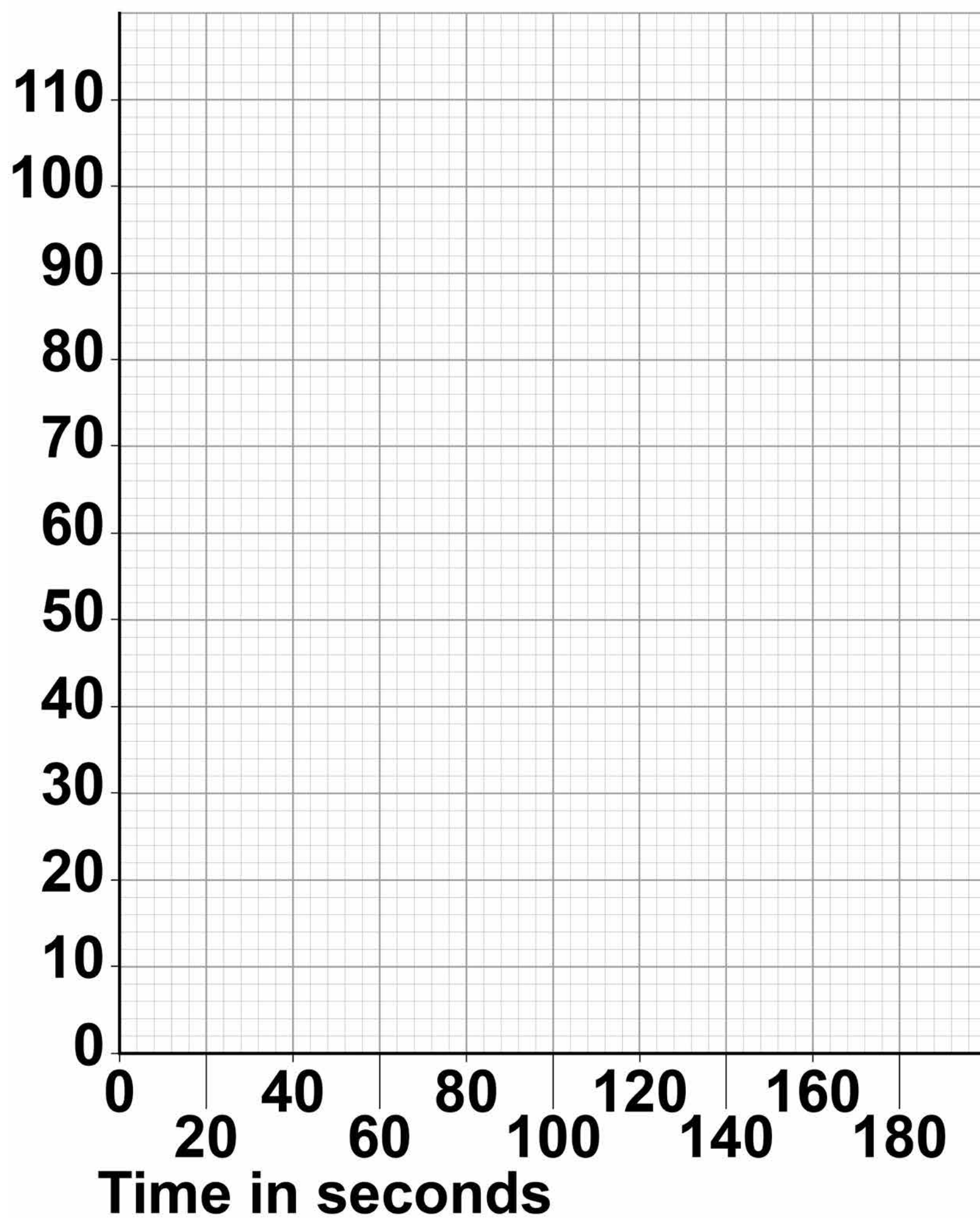
You do NOT need to draw a line of best fit. [2 marks]



51

FIGURE 6

**Mean volume
of gas collected
in cm³**



[Turn over]



FIGURE 7, on page 54, shows results of the experiment with the hydrochloric acid of a higher concentration.



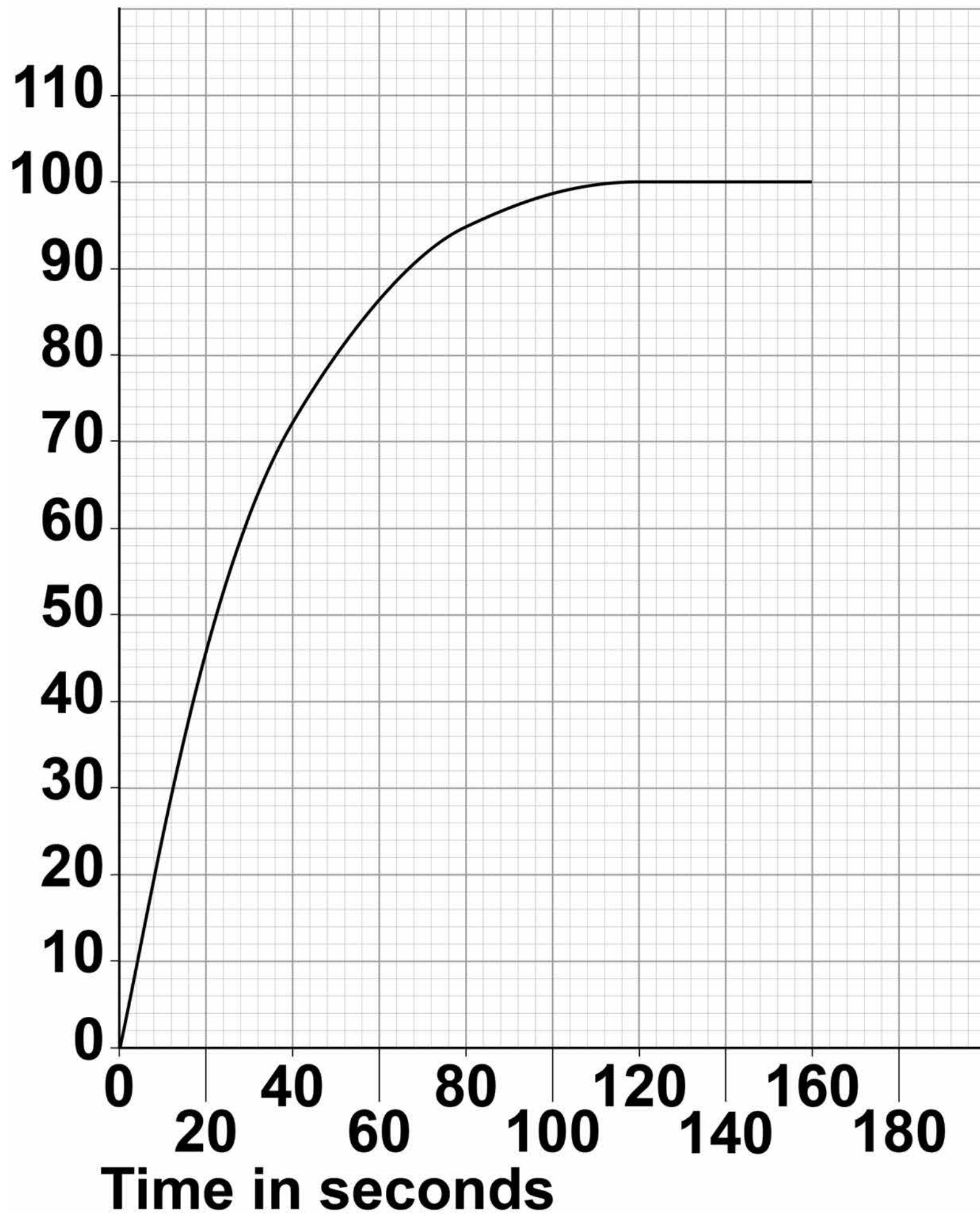
BLANK PAGE

[Turn over]



FIGURE 7

**Mean volume
of gas collected
in cm³**



55

07.5 Calculate the mean rate of reaction between 0 and 50 seconds.

Use FIGURE 7 and the equation:

mean rate of reaction =

$$\frac{\text{mean volume of gas collected}}{\text{time taken}}$$

[2 marks]

Mean rate of reaction =

_____ cm^3/s

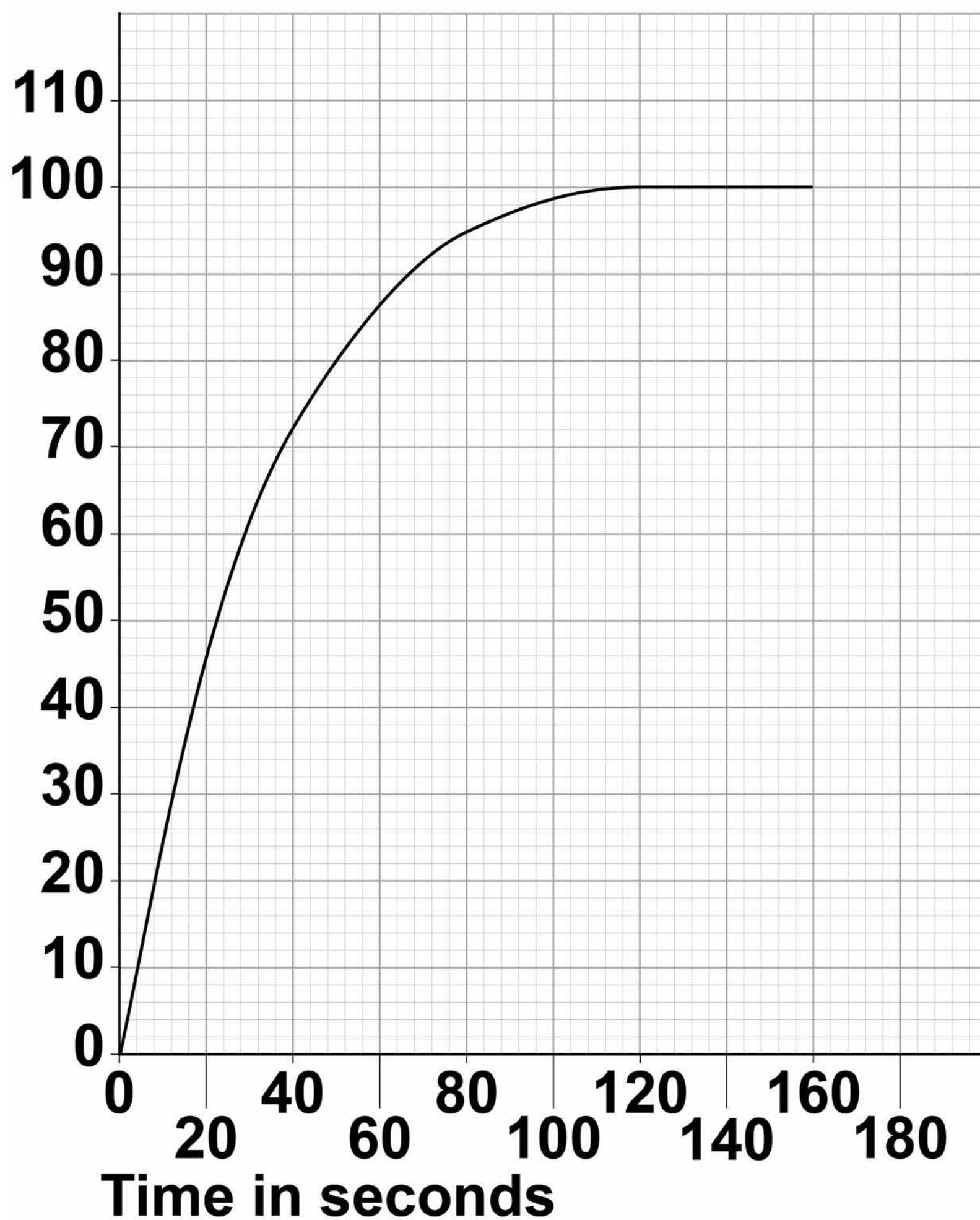
[Turn over]



56

Repeat of FIGURE 7

Mean volume
of gas collected
in cm^3



07.6 Describe how the **RATE OF REACTION** changes between 0 and 160 seconds.

Use FIGURE 7. [3 marks]

[Turn over]



07.7 The student concludes that the rate of reaction is greater when the concentration of hydrochloric acid is higher.

Why is the rate of reaction greater when the concentration of hydrochloric acid is higher?

Tick TWO boxes. [2 marks]

The particles are moving faster

The particles have more energy

The surface area of magnesium is smaller

There are more particle collisions each second

There are more particles in the same volume



07.8 The student tests the gas produced by bubbling it through limewater.

No change is seen in the limewater.

**Give ONE conclusion the student can make about the gas.
[1 mark]**

[Turn over]



60

07.9 The student tests the gas produced using a burning splint.

Name the gas the student is testing for.

Give the result of a positive test for this gas. [2 marks]

Name of gas _____

Result _____

17



61

BLANK PAGE

[Turn over]



0 8

This question is about chemicals in fireworks.

Coloured flames are produced because of the metal ions in the fireworks.

0 8 . 1

What colour flame would sodium ions produce? [1 mark]

0 8 . 2

Name a metal ion that would produce a green flame. [1 mark]



08.3 Some fireworks contain a mixture of metal ions.

Why is it difficult to identify the metal ions from the colour of the flame? [1 mark]

[Turn over]

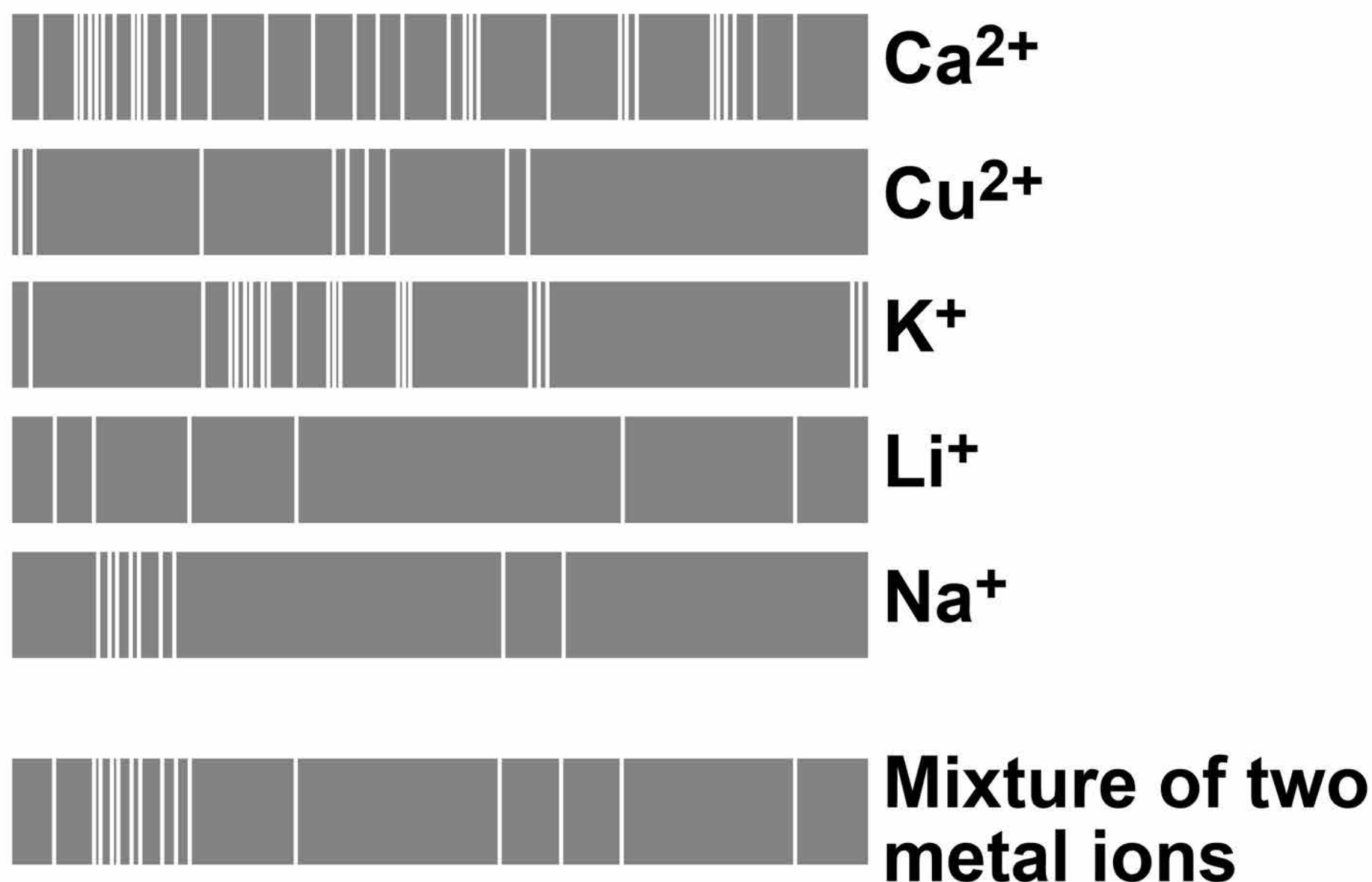


08.4 Flame emission spectroscopy is used to identify metal ions in a firework.

FIGURE 8 shows:

- the flame emission spectra of five individual metal ions
- a flame emission spectrum for a mixture of two metal ions.

FIGURE 8



65

Which TWO metal ions are in the mixture?

Tick TWO boxes. [2 marks]

 Ca^{2+} Cu^{2+} K^{+} Li^{+} Na^{+}

[Turn over]



66

The compounds in fireworks also contain non-metal ions.

A scientist tests a solution of the chemicals used in a firework.

0 8 . 5 Silver nitrate solution and dilute nitric acid are added to the solution.

A cream precipitate forms.

Which ion is shown to be present by the cream precipitate? [1 mark]



67

08.6 Describe a test to show the presence of sulfate ions in the solution.

**Give the result of the test if there are sulfate ions in the solution.
[3 marks]**

Test _____

Result _____

[Turn over]

9



0 9

Methylated spirit is a useful product made from a mixture of substances.

TABLE 6 shows the mass of the substances in a sample of methylated spirit.

TABLE 6

Substance	Mass in grams
Ethanol	265.5
Methanol	23.3
Pyridine	3.0
Methyl violet	1.5

0 9**1**

What name is given to a useful product such as methylated spirit? [1 mark]



09.2 Calculate the percentage by mass of methanol in methylated spirit.

Use TABLE 6. [2 marks]

Percentage = _____ %

[Turn over]



70

Methylated spirit contains ethanol and is available cheaply.

Methylated spirit also contains:

- **pyridine which has a very unpleasant smell**
- **methyl violet which makes the mixture purple.**

09.3 Suggest why pyridine and methyl violet are added to ethanol to make methylated spirit. [1 mark]

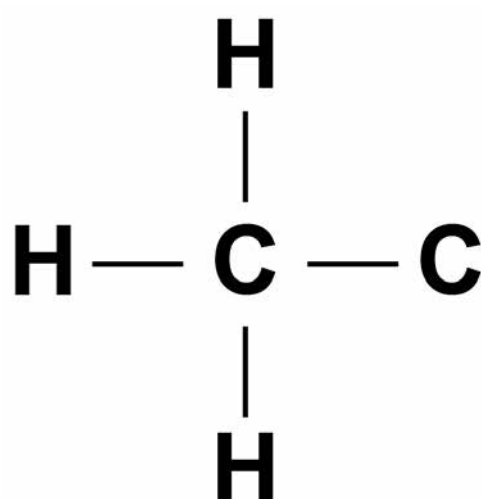
09.4 Suggest ONE use of methylated spirit. [1 mark]



09.6 FIGURE 9 shows part of the displayed formula for ethanol.

Complete FIGURE 9. [1 mark]

FIGURE 9



09.7 Name the gas produced when sodium is added to ethanol.
[1 mark]



73

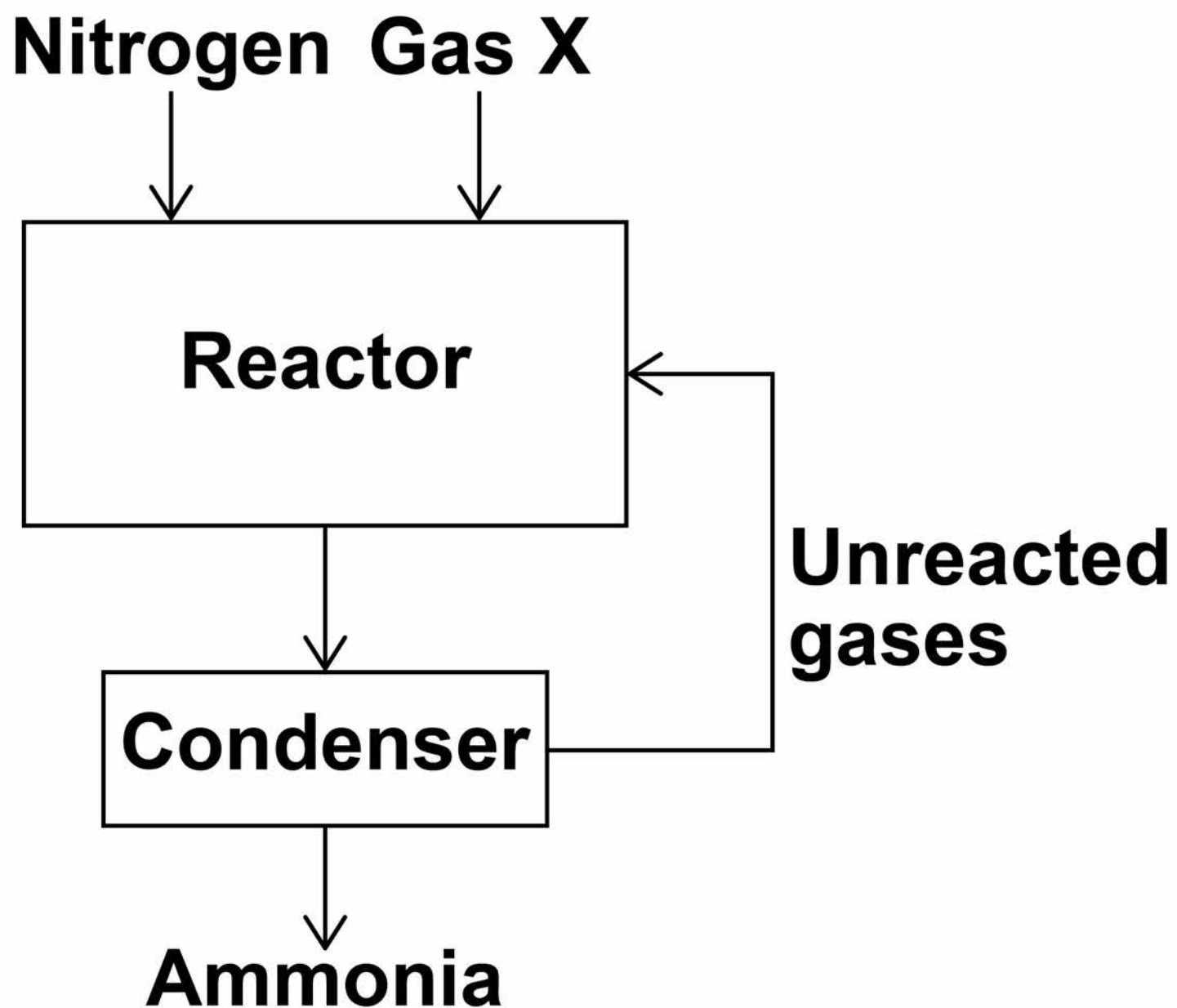
09.8 Methanol is used to produce methanoic acid.

What type of substance reacts with methanol to produce methanoic acid? [1 mark]

[Turn over]

11



1 0**This question is about gases.****FIGURE 10 shows how nitrogen is used in the Haber Process to produce ammonia.****FIGURE 10**

10.1 Gas X in FIGURE 10 is obtained from methane.

Name gas X. [1 mark]

10.2 Give the approximate temperature and pressure used in the reactor. [2 marks]

Temperature _____

Pressure _____

10.3 The mixture of gases from the reactor cools in the condenser.

Suggest why ammonia condenses but the other gases do not. [1 mark]

[Turn over]



The Earth's early atmosphere was different to Earth's atmosphere today.

Scientists think that the Earth's early atmosphere was like the atmosphere found on Venus today.

TABLE 7 shows the amounts of carbon dioxide and oxygen in the atmospheres of Venus and Earth today.

TABLE 7

Gas	Percentage (%) in Venus' atmosphere today	Percentage (%) in Earth's atmosphere today
Carbon dioxide	96.50	0.04
Oxygen	0.00	20.95



10.5 Why are scientists NOT certain about the percentage of each gas in the Earth's early atmosphere? [1 mark]

END OF QUESTIONS

11



There are no questions printed on this page



80

There are no questions printed on this page

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
TOTAL	

Copyright information

For confidentiality purposes, from the November 2015 examination series, acknowledgements of third party copyright material will be published in a separate booklet rather than including them on the examination paper or support materials. This booklet is published after each examination series and is available for free download from www.aqa.org.uk after the live examination series.

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders may have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements. If you have any queries please contact the Copyright Team, AQA, Stag Hill House, Guildford, GU2 7XJ.

Copyright © 2018 AQA and its licensors. All rights reserved.

IB/M/Jun18/NC/8462/2F/E2

