

GENERAL CERTIFICATE OF SECONDARY EDUCATION

GATEWAY SCIENCE

B741/01

CHEMISTRY B

Unit B741: Chemistry modules C1, C2, C3 (Foundation Tier)

Candidates answer on the question paper
 A calculator may be used for this paper

OCR Supplied Materials:

None

Duration: 1 hour 15 minutes

Other Materials Required:

- Pencil
- Ruler (cm/mm)

Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

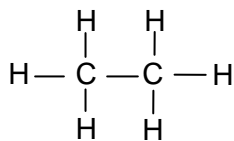
INFORMATION FOR CANDIDATES

- Your quality of written communication is assessed in questions marked with a pencil (✎).
- The Periodic Table can be found on the back page.
- The number of marks for each question is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **75**.
- This document consists of **24** pages. Any blank pages are indicated.

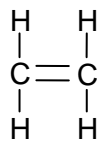
Examiner's Use Only:			
1		8	
2		9	
3		10	
4		11	
5		12	
6		13	
7			
Total			

Section A – Module C1

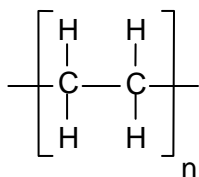
1 Look at the displayed formulas of some carbon compounds.



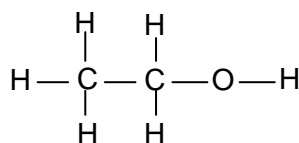
compound A



compound B



compound C



compound D

(a) Which compound is **not** a hydrocarbon?

Explain why.

.....
 [2]

(b) Compound C is a polymer called poly(ethene).

What is the name of the **monomer** used to make poly(ethene)?

..... [1]

(c) Waste polymers are not just thrown away or put in dustbins.

They need to be disposed of properly.

Describe how waste polymers can be disposed of.

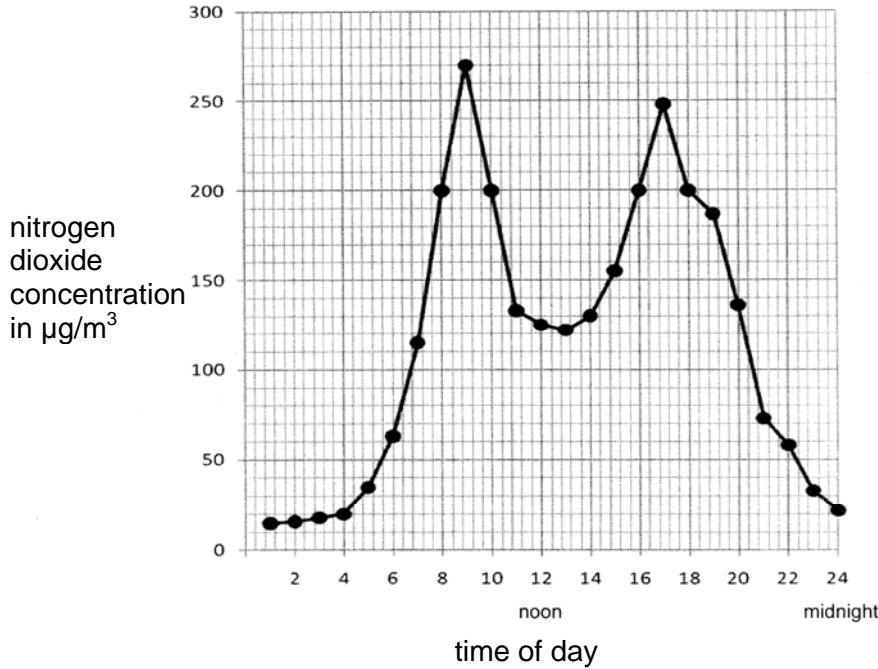
.....
 [2]

[Total: 5]

2 Emily and Sophia investigate the nitrogen dioxide concentration in air on a city road.

Nitrogen dioxide is an oxide of nitrogen.

Look at the graph. It shows their results.



(a) What is the highest concentration of nitrogen dioxide recorded during the 24 hour period?

answer µg/m³ [1]

(b) Suggest an explanation for the shape of the graph.

.....

 [3]

(c) Nitrogen dioxide is an oxide of nitrogen.

Write about the problems caused by nitrogen dioxide pollution.

.....

 [2]

[Total: 6]

3 Ropewise is a company that makes climbing ropes for mountaineers.



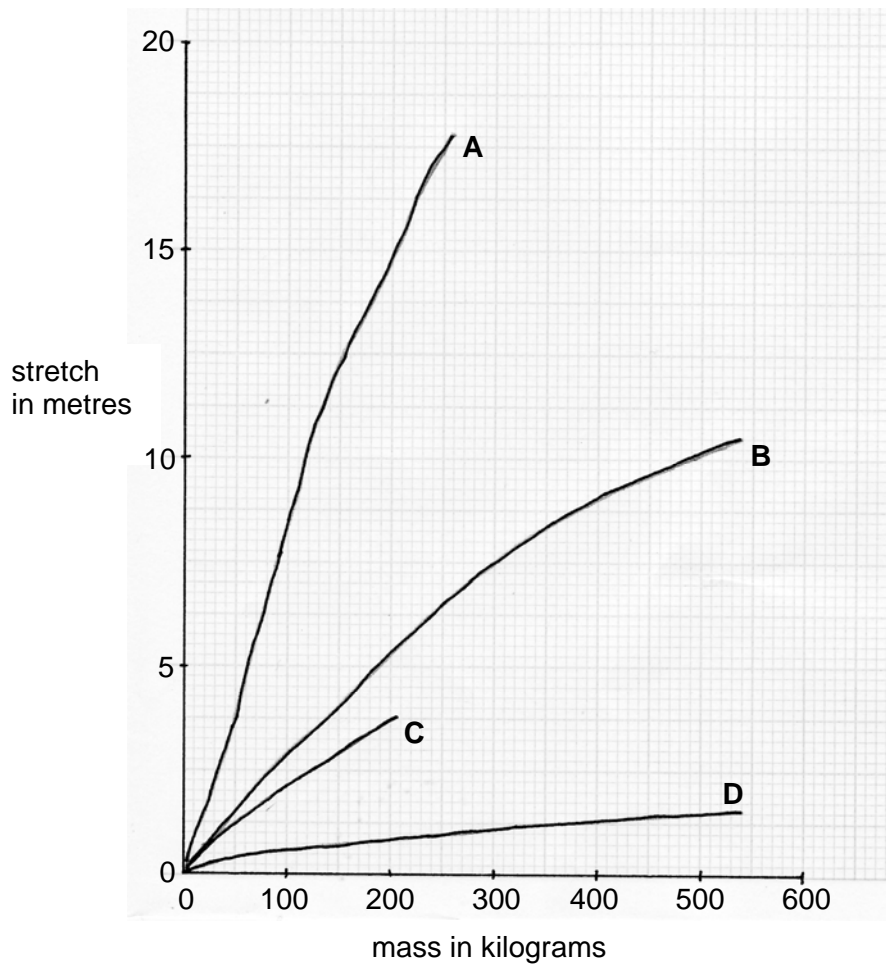
The company tests 50m lengths of rope.

The ropes are made from 4 different polymers **A**, **B**, **C** and **D**.

They add masses to each rope and measure how much each one stretches.

They do this until the rope breaks.

Look at the graph. It shows their results.



A mountaineering club says that a rope must be able to carry a mass of at least 300kg before it breaks.

What properties does a rope used for climbing need?

Which polymer would you choose to make the rope and why?



The quality of written communication will be assessed in your answer to this question.

..... [6]

[Total: 6]

4 Some foods contain salt as a food additive.

Look at the table. It gives the salt content of some foods.

food	salt content in g per 100g food
bacon	3.0
butter	2.0
crisps	1.6
beef	0.2
cheese	1.6
sausage	2.8
bread	0.5
apple	0.01
chicken	0.2
potato	0.01
tomato	0.01

The Department of Health recommends that no more than 6.0g salt should be eaten each day.

Look at the table. It shows what Tom eats in one day.

food	salt content in g
50g bacon	1.5
25g crisps	0.4
100g chicken
200g bread
25g butter
100g potato
100g tomato
total salt content

- (a) Calculate the total amount of salt Tom eats and decide whether he has exceeded the Department of Health guidelines.

Do your calculations in the table.

.....

.....

..... [2]

- (b) Complete the table about food additives.

One has been done for you.

type of food additive	job it does
food colouring	improve colour of food
antioxidant
.....	helps oil and water mix and not separate

[2]

- (c) Baking powder is a raising agent. It helps cakes to rise.

Baking powder gives off carbon dioxide when it is heated.

Describe the test for carbon dioxide.

.....

..... [2]

[Total: 6]

5 This question is about perfumes.



One property of perfumes is that they do not react with water.

Write down two **other** properties that perfumes must have.

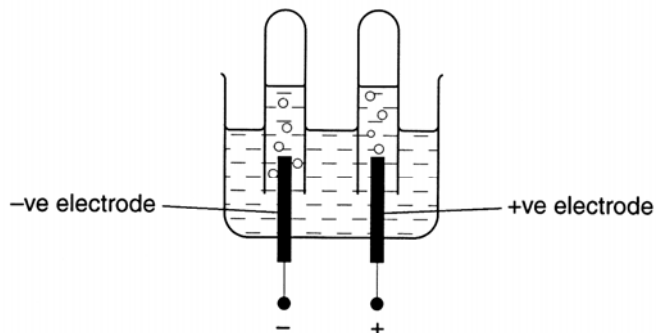
1.....

2..... [2]

[Total: 2]

Section B – Module C2

6 Look at the diagram. It shows the electrolysis of concentrated sodium chloride (salt) solution.



(a) Two gases are made. One of the gases is chlorine.

Write down the name of the **other** gas that is made.

..... [1]

(b) What is the chemical test for chlorine?

.....
 [2]

(c) Match each substance to its use.

You should only three straight lines.

substance

use

chlorine

making soap

sodium chloride
(salt)

a preservative

sodium hydroxide

making plastics

[2]

[Total: 5]

7 Look at the data about some minerals.

mineral	formula	relative hardness	density in g/cm ³	cost per kg
limestone	CaCO ₃	3	1.5	low
marble	CaCO ₃	5	2.6	high
granite	SiO ₂	7	2.8	high
diamond	C	10	3.2	very high

(a) Which mineral is an **element**?

..... [1]

(b) Which mineral will scratch most easily?

Explain why.

.....
 [2]

(c) Which mineral would you choose to make tiles for a bathroom floor?

Explain your answer.

.....

 [2]

(d) When limestone, CaCO₃, is heated, thermal decomposition happens.

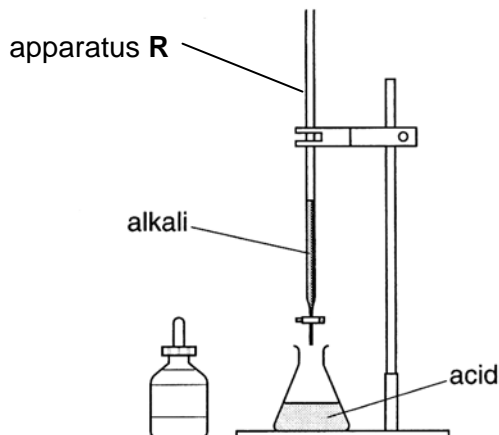
Write down the **names** of the two substances made.

..... and [2]

[Total: 7]

8 Stuart and Claire are making a fertiliser using neutralisation.

Look at the diagram. It shows the apparatus they use.



(a) What is the name of apparatus R?
 [1]

(b) They use nitric acid and ammonia.
 What is the name of the fertiliser they make?
 [1]

(c) They want to make ammonium sulfate.
 They use ammonia as the alkali.
 Which acid should they use?
 [1]

(d) Urea is another fertiliser.



How many different **elements** are present in urea and which one is essential for plant growth?

.....
 [2]

(e) Write about why farmers use fertilisers and a problem that using fertilisers might cause.

 [2]

[Total: 7]

Turn over

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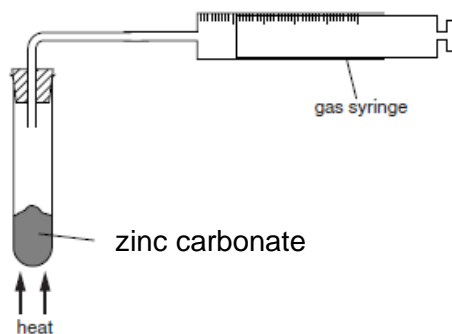
Section C – Module C3

10 Zinc carbonate decomposes when heated.

Carbon dioxide and zinc oxide are made.

Jenna heats a sample of zinc carbonate.

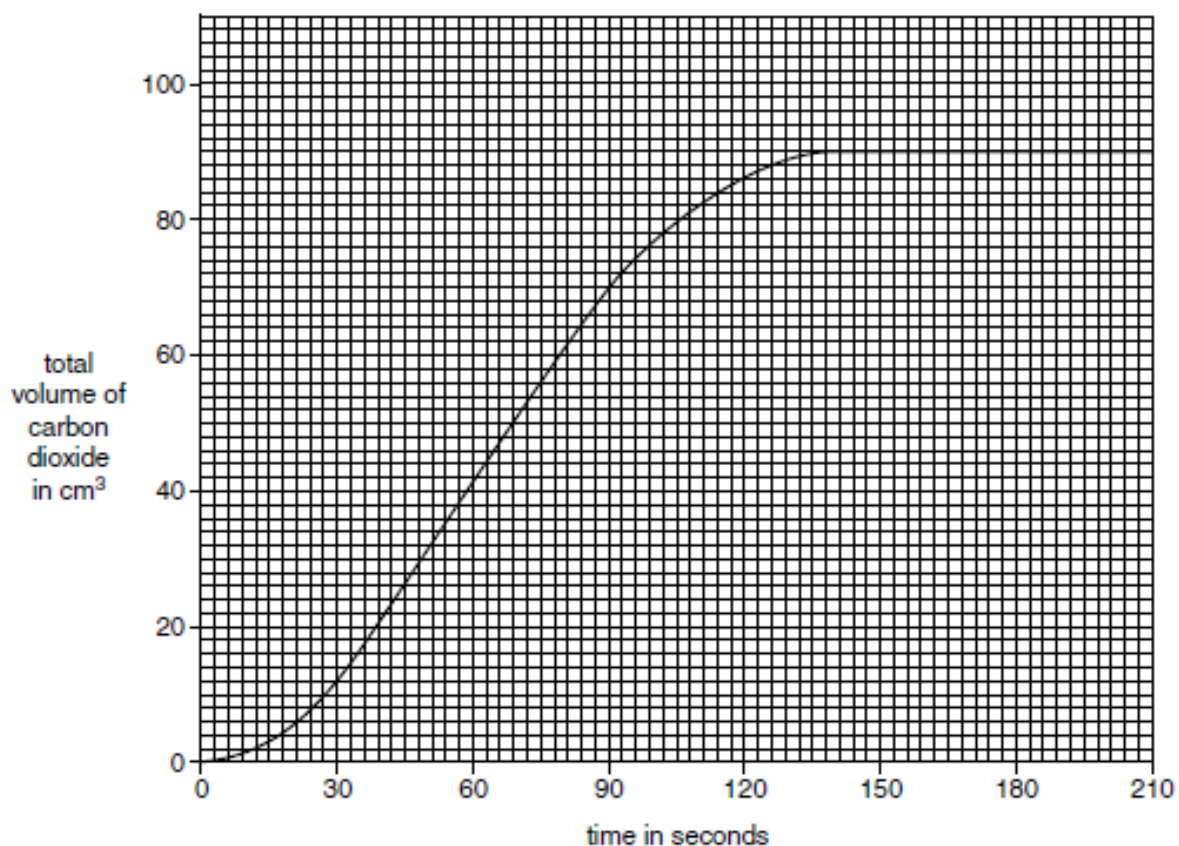
Look at the apparatus she uses.



The carbon dioxide made is collected in a gas syringe.

Every 30 seconds, she measures the total volume of carbon dioxide in the gas syringe.

Look at the graph of Jenna's results.



(a) What is the total volume of carbon dioxide collected in the first 90 seconds?

answer..... cm³

[1]

(b) At which time is the reaction the **fastest**?

Choose from

0 – 30 seconds

60 – 90 seconds

120 – 150 seconds

180 – 210 seconds

answer[1]

(c) (i) How long did it take for the reaction to finish?

answer..... seconds

[1]

(ii) Jenna repeats the experiment using the same mass of zinc carbonate.

This time she uses a hotter flame to heat the zinc carbonate.

What happens to the time it takes to finish the reaction?

.....[1]

(d) Jenna repeats the experiment a second time.

This time she uses half the mass of zinc carbonate.

What volume of carbon dioxide is made at the end of the reaction?

Explain your answer.

.....
.....
.....[2]

[Total: 6]

11 Stowmarket synthetics manufacture copper sulfate by two different processes.



The water and carbon dioxide made are waste products.

Look at the table of relative formula masses.

compound	formula	relative formula mass, M_r
copper oxide	CuO	80
sulfuric acid	H_2SO_4	
copper sulfate	CuSO_4	160
water	H_2O	18
copper carbonate	CuCO_3	124
carbon dioxide	CO_2	44

The relative atomic mass of H = 1, of C = 12, of O = 16, of S = 32 and of Cu = 64.

(a) Calculate the relative formula mass of sulfuric acid, H_2SO_4 .

.....

[1]

(b) Stowmarket Synthetics know that both atom economy and percentage yield are important.

(i) Show that that atom economy for making copper sulfate by process 1 is 89.9%

.....

[2]

(ii) Stowmarket Synthetics uses 10.0 tonnes of copper oxide in process 1.

A scientist predicts they should make 20.0 tonnes of copper sulfate.

They actually make 17.2 tonnes.

Show that the percentage yield of copper sulfate is 86.0%.

.....

.....

.....

..... [2]

(c) Look at the table.

It gives information about the atom economy and percentage yield for making copper sulfate.

process	atom economy	percentage yield
1	89.9	86.0
2	72.1	94.4

Which process is 'greener'?

process

Explain your answer.

.....

..... [1]

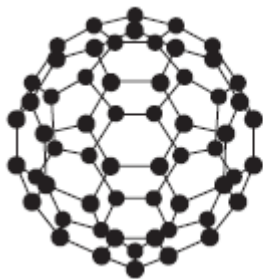
[Total: 6]

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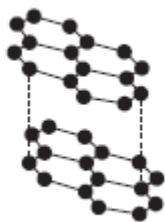
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12 Diamond is a form of carbon.

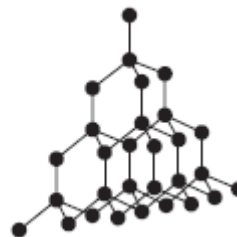
Look at the structures of the three forms of carbon.



structure A



structure B



diamond

(a) What is the name of the form of carbon with structure A?

..... [1]

(b) The form of carbon with structure B is a black solid with a high melting point.

It is also slippery and does not conduct electricity.

(i) What is the name of the form of carbon with structure B?

..... [1]

(ii) Describe some of the physical properties of diamond and explain why diamond is used in cutting tools.

.....

 [3]

[Total: 5]

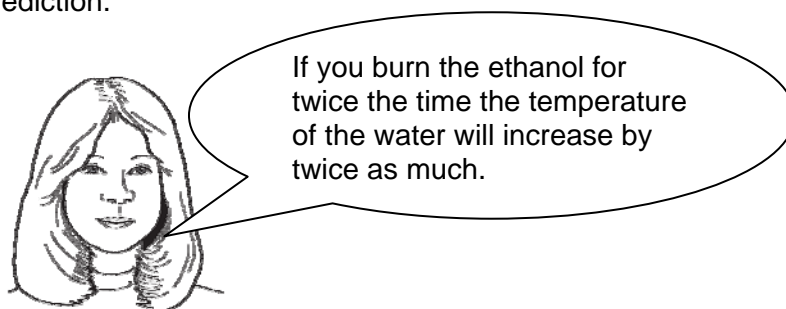
13 Ethanol is a liquid fuel.

Alia investigates the energy released when ethanol burns.

She heats 100 cm^3 of water using the energy released when ethanol burns.

She decides to change the time that she heats the 100 cm^3 of water.

She makes a prediction.



Look at Alia's results.

time ethanol burns in minutes	temperature of water before heating in $^{\circ}\text{C}$	temperature of water after heating in $^{\circ}\text{C}$
1	20	25
2	21	30
3	17	32
4	21	40
5	20	45

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PERIODIC TABLE

1	2											3	4	5	6	7	0		
		Key relative atomic mass atomic symbol <small>name</small> atomic (proton) number										1 H hydrogen 1							4 He helium 2
7 Li lithium 3	9 Be beryllium 4											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10		
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18		
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	63.5 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36		
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	[98] Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54		
133 Cs caesium 55	137 Ba barium 56	139 La* lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	[209] Po polonium 84	[210] At astatine 85	[222] Rn radon 86		
[223] Fr francium 87	[226] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated								

* The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.