



F

Friday 6 June 2014 – Afternoon

## GCSE GATEWAY SCIENCE CHEMISTRY B

**B741/01** 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

**Other materials required:**

- Pencil
- Ruler (cm/mm)

**Duration:** 1 hour 15 minutes



Candidate forename		Candidate surname	
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Centre number						Candidate number				
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### INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

### INFORMATION FOR CANDIDATES

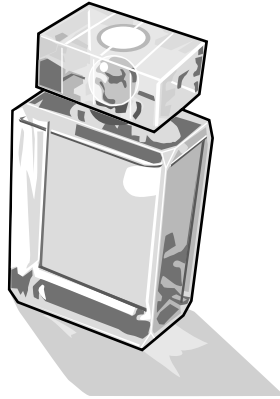
- The quality of written communication is assessed in questions marked with a pencil (✎).
- The Periodic Table can be found on the back page.
- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **75**.
- This document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

2

Answer **all** the questions.

**SECTION A – Module C1**

1 Stowmarket Synthetics make perfumes.



They make and test four new perfumes.

(a) Perfumes must be tested before they are **permitted** to be used.

Write about **two** reasons why.

.....

.....

.....

..... [2]

3

(b) Look at some of the properties of the four new perfumes.

Perfume	Boiling point in °C	Solubility in water (0 = insoluble and 10 = very soluble)
G	130	10
I	340	0
J	40	0
K	50	5

(i) Which perfume has the best set of properties?

.....

Write down **two** reasons for your choice of perfume.

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

(ii) Richard works for Stowmarket Synthetics.

He thinks there is not enough information in the table to decide which perfume should be manufactured.

He thinks the **cost** of making the perfume is important.

Write down one **other** piece of information that is important.

..... [1]

[Total: 5]

4

2 Coal is a fossil fuel. It is a non-renewable fuel.

(a) What is meant by a **non-renewable** fuel?

.....  
 ..... [1]

(b) Some power stations burn coal.

Coal often contains **sulfur** as an impurity.

The sulfur reacts with oxygen to make sulfur dioxide.

Write down the **word equation** for this reaction.

..... [1]

(c) Sulfur dioxide causes acid rain.

Write about **two** environmental problems caused by acid rain.

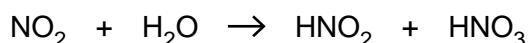
.....  
 .....  
 .....  
 ..... [2]

(d) Nitrogen dioxide is also made in a power station.

To stop the nitrogen dioxide going into the atmosphere it is reacted with water.

Nitrogen dioxide reacts with water to make two acids.

Copy out and **balance** the **symbol equation** for this reaction.



..... [1]

(e) Karen burns some coal.

She wants to find out if any carbon dioxide is made.

Describe the chemical test she uses.

Name of chemical .....

Effect of carbon dioxide on the chemical .....

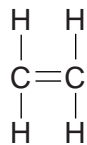
..... [2]

[Total: 7]

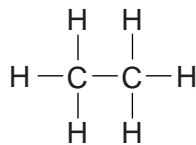
## 5

3 This question is about compounds containing carbon.

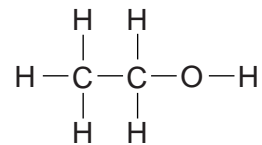
Look at the displayed formulas of some compounds.



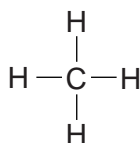
compound **A**



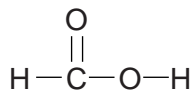
compound **B**



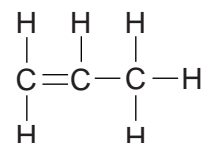
compound **C**



compound **D**



compound **E**



compound **F**

(a) Two compounds have molecules that contain only **five** atoms.

Which two?

..... and .....

[1]

(b) Two compounds decolourise bromine water.

Which two?

..... and .....

[1]

(c) Explain why compound **B** is a hydrocarbon but compound **C** is not a hydrocarbon.

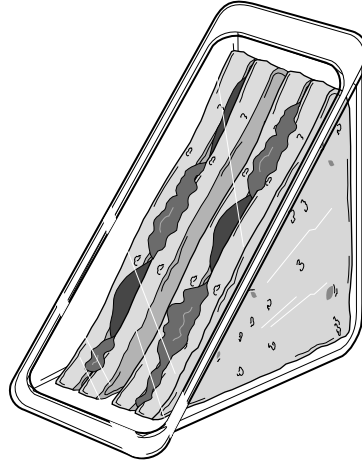
.....  
 .....  
 .....  
 ..... [3]

[Total: 5]

4 Anna buys sandwiches from a shop.

The sandwiches are in plastic packaging.

The plastic is made from a polymer called poly(propene).



Two properties of poly(propene) are:

- it is non-biodegradable
- it is insoluble in water.

(a) Explain why these two properties make poly(propene) suitable for making the packaging and suggest, with a reason, one **other** suitable property needed by poly(propene).



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

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

7

(b) Anna finishes her sandwiches.

She throws the packaging into a dustbin.

Write about **two** ways the waste plastic from the dustbin is disposed of.

.....

.....

.....

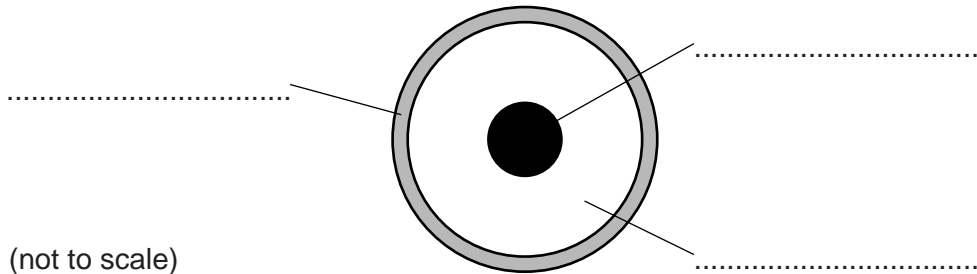
..... [2]

[Total: 8]

SECTION B – Module C2

5 This question is about the structure of the Earth.

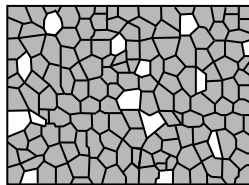
(a) Label the diagram of the Earth.



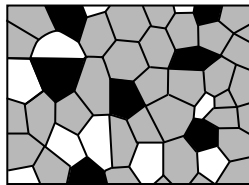
[2]

(b) Igneous rocks are made when molten rock cools.

Look at the diagrams of two different types of igneous rock, **A** and **B**.



rock A



rock B

One rock was made when molten rock cooled **slowly**.

Which rock? .....

Explain your answer.

.....  
 ..... [1]

(c) Bornite is a mineral extracted from the Earth.

Bornite has the chemical formula  $\text{Cu}_5\text{FeS}_4$ .

How many different **elements** are in  $\text{Cu}_5\text{FeS}_4$ ?

..... [1]

[Total: 4]



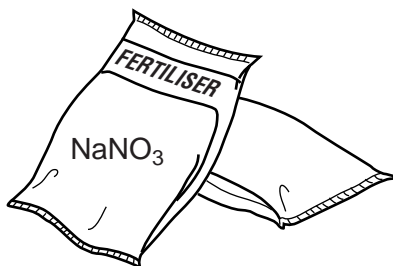
**BLANK PAGE**

**Question 6 begins on page 10**

**PLEASE DO NOT WRITE ON THIS PAGE**

6 This question is about fertilisers.

(a) Fertilisers are chemicals that provide plants with **essential elements**.



Sodium nitrate,  $\text{NaNO}_3$ , is a fertiliser.

Write down the **name** of the essential element for plant growth found in sodium nitrate.

..... [1]

(b) Ammonium sulfate is another fertiliser.

Ammonium sulfate is made by reacting an acid with an alkali.

Write down the name of the **acid** used to make ammonium sulfate.

..... [1]

(c) Fertilisers can be **beneficial** but may also cause **problems**.

Write about the benefits and problems of using fertilisers.

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



12

7 Many different materials are needed to build a car.



(a) (i) Suggest a property of glass that makes it useful for making a car windscreen.

..... [1]

(ii) Some car bodies are now built from aluminium instead of steel.

One advantage of using aluminium is that it is less dense than steel.

Write down **one other advantage** of building car bodies from aluminium instead of steel.

..... [1]

(b) Look at the table.

It shows information about some of the materials used to build a car.

Material	Density in g/cm <sup>3</sup>	Electrical conductivity	Flexibility
aluminium	2.7	very high	low
glass	2.5	very low	low
PVC	1.4	very low	high
steel	7.8	high	low

Explain why PVC is used for covering the electrical wires in a car.

Use the information from the table.

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

[Total: 4]

13

**BLANK PAGE**

**Question 8 begins on page 14**

**PLEASE DO NOT WRITE ON THIS PAGE**

8 Sodium chloride (salt) is an important raw material in the chemical industry.

(a) Sodium, Na, reacts with chlorine, Cl<sub>2</sub>.

Sodium chloride, NaCl, is made.

Write a **balanced symbol** equation for this reaction.

..... [2]

(b) The electrolysis of concentrated sodium chloride solution (brine) makes:

- hydrogen
- chlorine
- sodium hydroxide.

(i) Write down one **use** of **chlorine**.

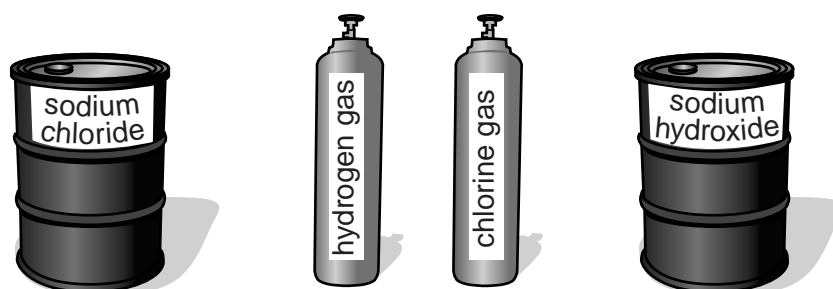
..... [1]

(ii) Describe the chemical test for chlorine and write down what you would see.

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

15

(c) Trevor needs to store these four chemicals.



Trevor investigates different metals, **A**, **B**, **C** and **D**.

Look at the results of his investigation.

	Rate of corrosion of metal by chemical (1 = very slow, 3 = fast)			
	Metal A	Metal B	Metal C	Metal D
chlorine gas	1	2	3	3
hydrogen gas	1	1	1	1
sodium chloride	3	1	1	2
sodium hydroxide	1	3	1	2

Trevor concludes that he **cannot** use the same metal to make the container for each chemical.

Do you think that Trevor has made the correct conclusion? .....

Explain your answer using the evidence in the table.

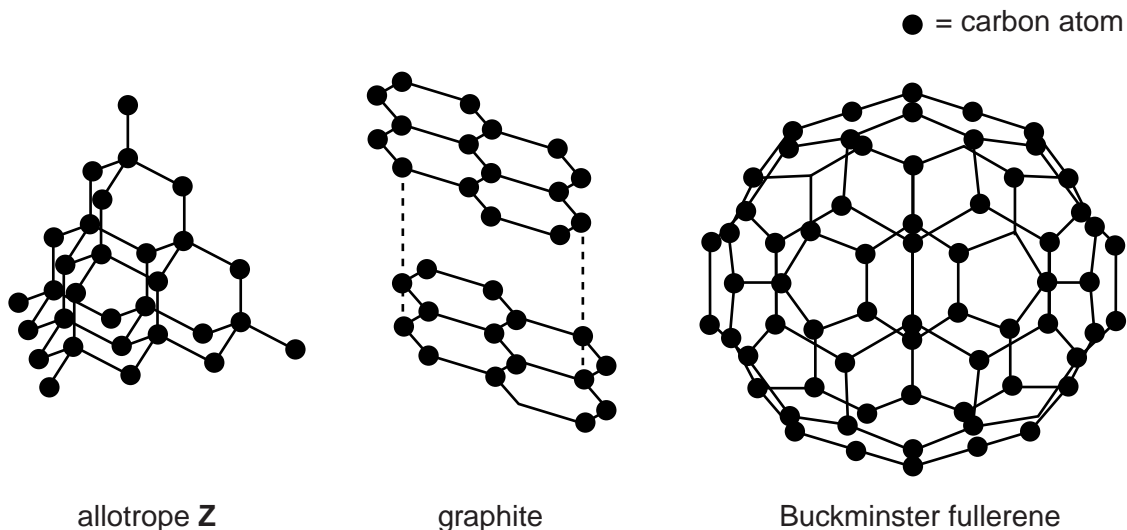
.....  
 .....  
 ..... [2]

[Total: 7]

SECTION C – Module C3

9 This question is about carbon.

Look at the structures of the three allotropes of carbon.



(a) What is the name of allotope Z?

..... [1]

(b) One property of graphite is that it is slippery.

Write about two **other** properties of graphite.

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

(c) Fullerenes can be used in new drug delivery systems for patients who are ill in hospitals.

Explain why fullerenes can be used.

.....  
 ..... [1]

[Total: 4]



17

**BLANK PAGE**

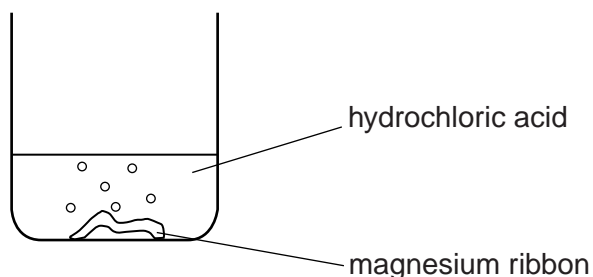
**Question 10 begins on page 18**

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## 18

10 Rachel investigates the reaction between magnesium and hydrochloric acid.

She adds a piece of magnesium ribbon to hydrochloric acid in a beaker.



Rachel measures the time it takes for all the magnesium ribbon to react.

This is the reaction time.

She does four different experiments.

Look at Rachel's prediction.



Look at Rachel's results.

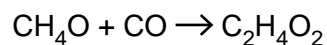
Experiment number	Mass of magnesium used in g	Volume of acid used in cm <sup>3</sup>	Concentration of acid in mol/dm <sup>3</sup>	Reaction time in seconds
1	0.05	25	1.0	30
2	0.10	25	1.0	30
3	0.05	50	1.0	30
4	0.05	50	2.0	15



11 Ethanoic acid,  $C_2H_4O_2$ , can be made by several different processes.

Three of these are process **R**, process **S** and process **T**.

(a) In process **R**, methanol reacts with carbon monoxide.



(i) Process **R** has 100% atom economy.

What does 100% atom economy mean?

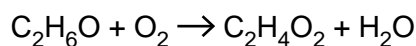
.....  
 .....  
 ..... [1]

(ii) A factory uses 16 tonnes of methanol to make 30 tonnes of ethanoic acid.

What mass of carbon monoxide is needed?

.....  
 mass of carbon monoxide = ..... tonnes [1]

(b) In process **S**, ethanol is oxidised using oxygen.



Mike knows that 46 tonnes of ethanol should make 60 tonnes of ethanoic acid.

A factory uses 4.6 tonnes of ethanol.

Predict the mass of ethanoic acid that should be made.

.....  
 .....  
 predicted mass of ethanoic acid = ..... tonnes [1]

(c) Process **R** is a continuous process and process **S** is a batch process.

Explain the difference between a continuous process and a batch process.

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

21

(d) In process T, hydrocarbons are oxidised to make ethanoic acid.

Mike predicts that 5.2 tonnes of ethanoic acid should be made.

The factory actually makes 2.4 tonnes of ethanoic acid.

Calculate the percentage yield of ethanoic acid.

Write your answer to **two** significant figures.

.....

.....

.....

percentage yield = ..... %

[2]

[Total: 7]

12 Paraffin is a liquid fuel obtained from crude oil.

Heat energy is released when paraffin burns.

(a) What is the name of a reaction that releases heat energy?

Put a **ring** around the correct answer.

**catalysis**

**endothermic**

**evaporation**

**exothermic**

**filtration**

[1]

(b) Jenna investigates the amount of energy released when paraffin is burnt.

She does five experiments.

She uses the same mass of water in each experiment.

She uses a different mass of paraffin for each experiment.

Look at her results.

Mass of paraffin burnt in grams	Temperature increase of water in °C
1.0	12
2.0	24
3.0	36
4.0	48
5.0	60

(i) Jenna uses a spirit burner with paraffin in the investigation.

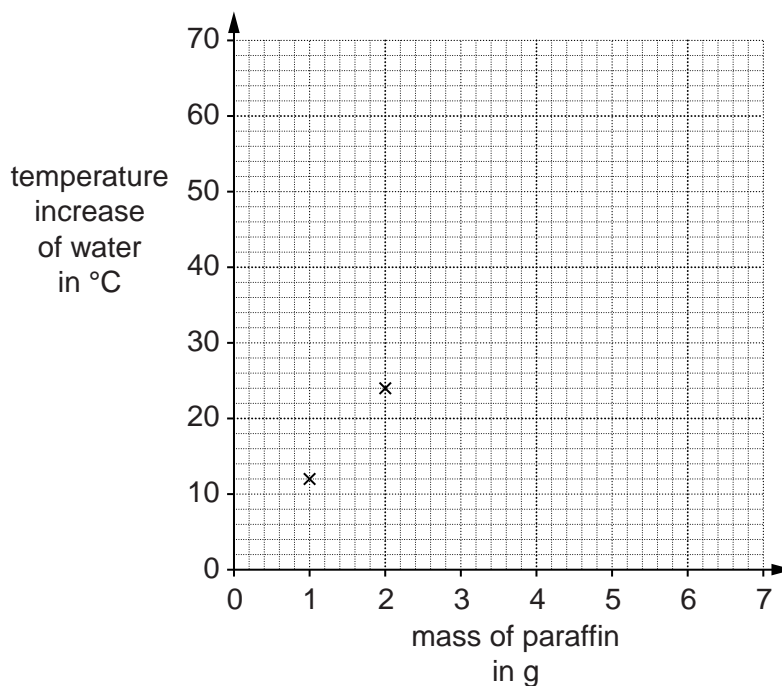
Draw a fully **labelled** diagram of the apparatus she must use to collect these results.

[3]

23

(ii) Plot Jenna's results on the graph below. Two points have been done for you.

Use the graph to predict what mass of paraffin would give a temperature rise of 30 °C.



mass of paraffin = ..... g

[2]

[Total: 6]

**END OF QUESTION PAPER**



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# The Periodic Table of the Elements

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

1	<b>H</b> hydrogen 1
---	---------------------------

relative atomic mass
atomic symbol
name
atomic (proton) number

Key

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

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.