

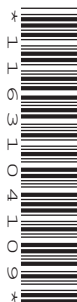
**F****Friday 6 June 2014 – Afternoon****GCSE GATEWAY SCIENCE
CHEMISTRY B****B741/01** Chemistry modules C1, C2, C3 (Foundation Tier)

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	
Centre number		Candidate number	

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.

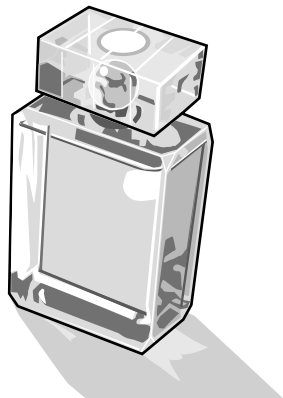
INFORMATION FOR CANDIDATES

- 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]

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.

.....

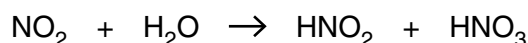
 [2]

(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

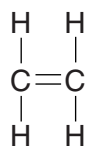
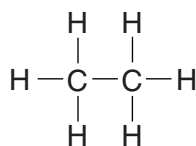
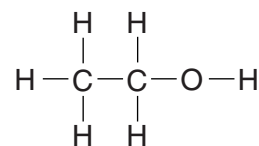
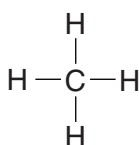
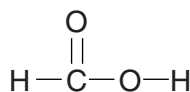
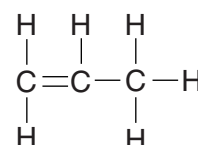
..... [2]

[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]

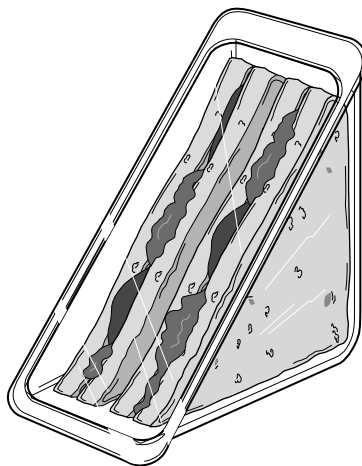
(c) Explain why compound **B** is a hydrocarbon but compound **C** is not a hydrocarbon.

.....

 [3]

[Total: 5]

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



- 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.

.....

.....

.....

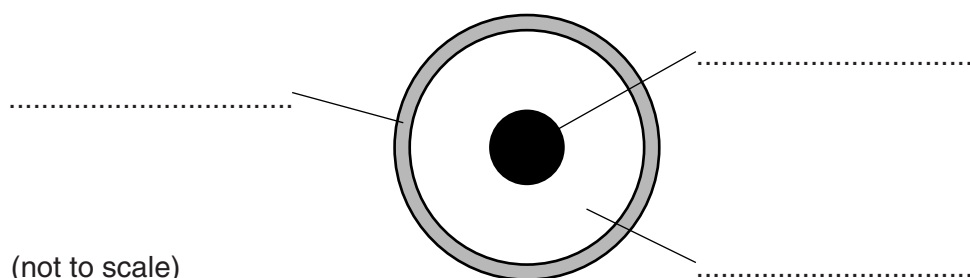
..... [2]

[Total: 8]

SECTION B – Module C2

5 This question is about the structure of the Earth.

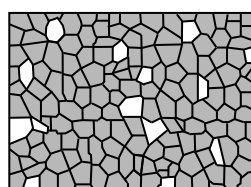
(a) Label the diagram of the Earth.



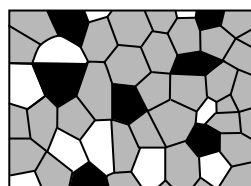
[2]

(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 Cu_5FeS_4 .

How many different **elements** are in Cu_5FeS_4 ?

..... [1]

[Total: 4]

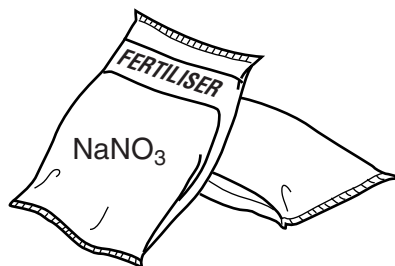
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Question 6 begins on page 10

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6 This question is about fertilisers.

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



Sodium nitrate, 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]

(d) Nitric acid is used to make fertilisers.

Ammonia and oxygen are used to manufacture nitric acid.

Water is the other product.

Write the **word equation** for this process and describe **costs** of making nitric acid.



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

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.....

..... [6]

[Total: 10]

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 ³	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

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Question 8 begins on page 14

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

(a) Sodium, Na, reacts with chlorine, Cl_2 .

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**.

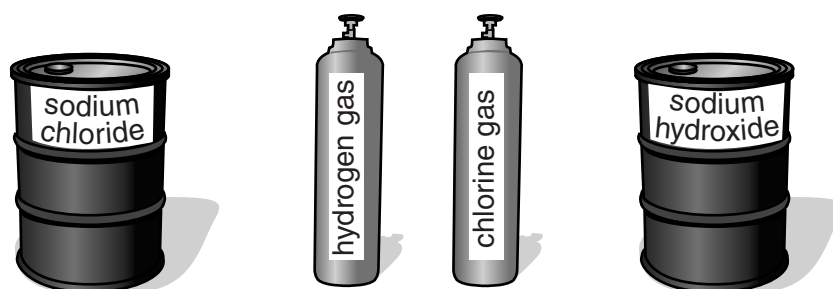
..... [1]

(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.

.....

.....

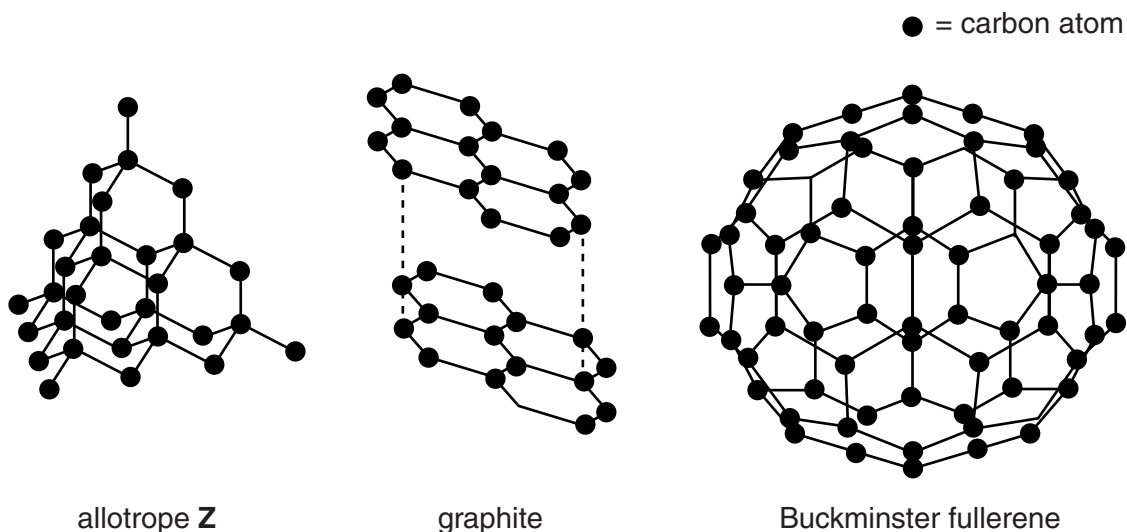
..... [2]

[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

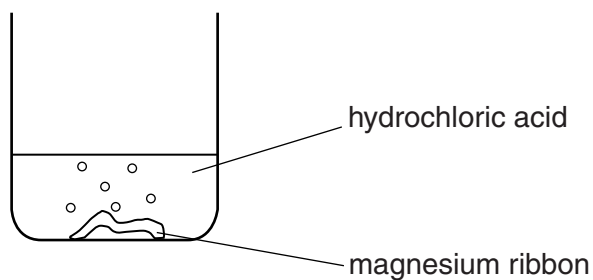
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Question 10 begins on page 18

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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 ³	Concentration of acid in mol/dm ³	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

19

- (a) Explain if Rachel's results support her prediction. Use the reacting particle model to explain the difference between the reaction time in experiments **3** and **4**.



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

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.....

.....

..... [6]

- (b) Rachel repeats experiment **1**. This time she uses acid at a **higher** temperature.

Predict, with a reason, the reaction time for this new experiment.

Predicted reaction time: seconds

Reason

.....

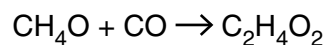
..... [2]

[Total: 8]

11 Ethanoic acid, $\text{C}_2\text{H}_4\text{O}_2$, 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?

.....

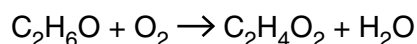
 [1]

(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.

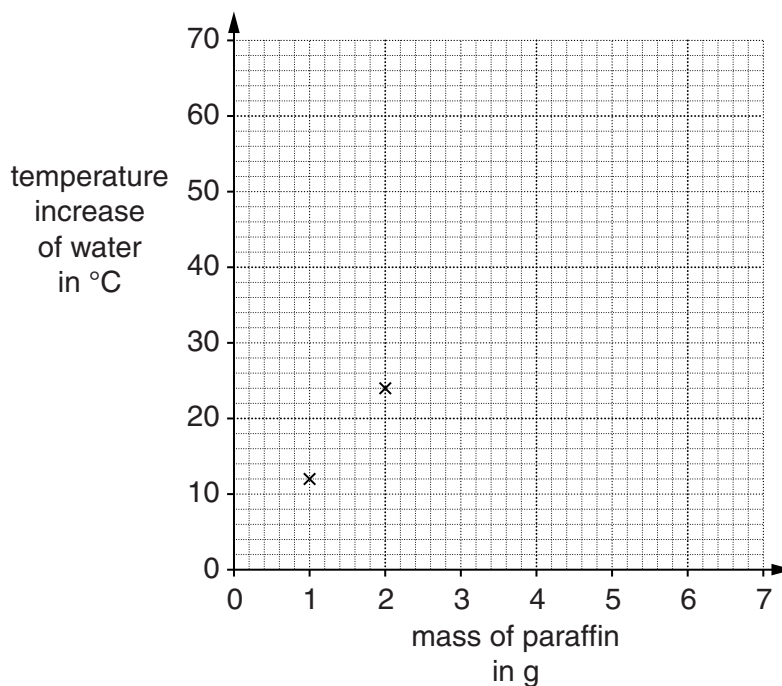
Draw a fully **labelled** diagram of the apparatus she must use to collect these results.

[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	Key										3	4	5	6	7	0
		relative atomic mass atomic symbol name atomic (proton) number															
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.

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