OCR
RECOGNISING ACHIEVEMENT

SPECIMEN F

GENERAL CERTIFICATE OF SECONDARY EDUCATION

GATEWAY SCIENCE

CHEMISTRY B

B741/01

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

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 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 **20** pages. Any blank pages are indicated.

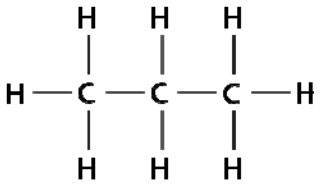
Examiner's Use Only:			
1		8	
2		9	
3		10	
4		11	
5		12	
6			
7			
Total			

Answer **all** the questions.

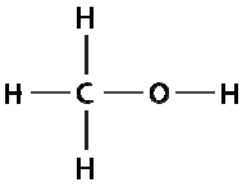
Section A – Module C1

1 This question is about carbon compounds.

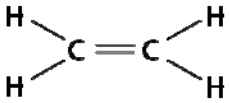
Look at the displayed formulas.



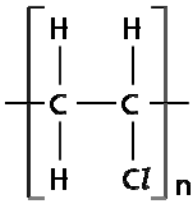
propane



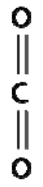
methanol



ethene



poly(chloroethene)



carbon dioxide

(a) Which compound is found in liquefied petroleum gases (LPG)?

Choose from the displayed formulas.

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

(b) How many atoms are present in the formula for propane?

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

(c) Write down the **names** of the two elements present in a hydrocarbon.

..... and ..... **[1]**

[Total: 3]

2 Phil is heating his house.

©Robert Brook/Science Photo Library

(a) Phil decides to use natural gas (methane) to heat his house.

Look at the word equation.

It shows what happens during the **complete combustion** of methane.

methane + oxygen ⟶ ..... + water

Finish the word equation.

[1]

(b) Phil uses a gas water heater.

He notices that the water heater is producing lots of soot.

It is important that he gets the gas heater serviced. Explain why.

.....

.....

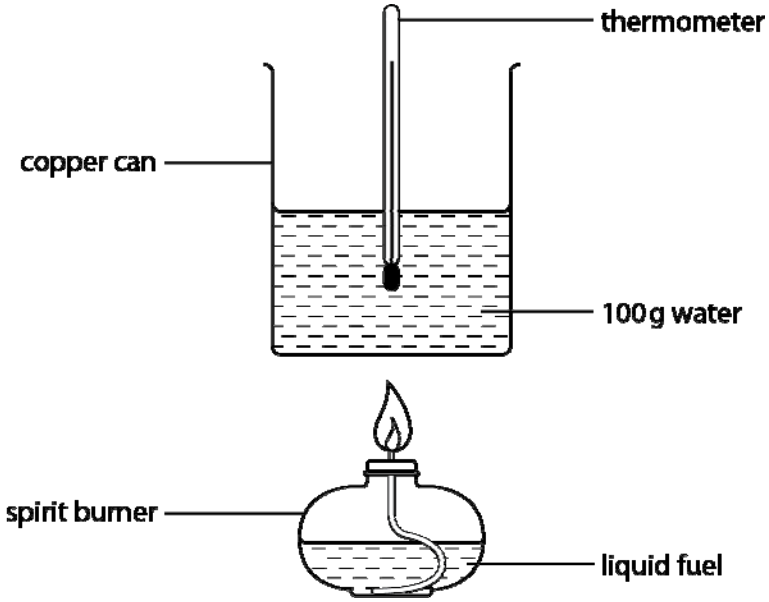
..... **[2]**

(c) Phil wants to heat his greenhouse.

He decides to test four liquid fuels to see which fuel is the best to use.

Look at the diagram.

It shows the apparatus he uses to measure the energy given out by these fuels.



Look at the table. It shows his results.

fuel	temperature of water at start in °C	temperature of water at end in °C	cost of fuel burned in pence
A	15	30	1.0
B	22	42	2.0
C	20	25	0.5
D	20	30	1.5

Phil decides to use fuel **C** to heat his greenhouse.

Evaluate if this is a sensible choice.

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

[Total: 6]

3 This question is about removing nail varnish.

(a) Some solvents can dissolve nail varnish.

Lesley investigates the solubility of different nail varnishes.

Look at the table of the results of her investigation.

solvent	**colour of nail varnish**				
	black	**blue**	**purple**	**red**	**white**
ethanol	S	I	S	I	I
ethyl ethanoate	S	S	S	S	S
petrol	S	S	I	S	I
propanone	S	S	S	S	S
water	I	I	I	I	I

I = insoluble and S = soluble

(i) Which solvent did not dissolve any of the nail varnishes?

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

(ii) Why is ethyl ethanoate a better solvent for nail varnishes than petrol?

.....

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

(b) Finchfield Pharmaceuticals make a new nail varnish remover.

It must be tested before it can be approved for use by humans.

Give **two** examples of risks that should be tested for.

.....

.....

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

[Total: 4]

4 (a) Look at the list. It shows some of the gases found in **clean** air.

oxygen

carbon dioxide

water vapour

Write down the name of one **other** gas present in **clean** air.

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

(b) Sulfur dioxide causes air pollution.

Write about the **effects** of sulfur dioxide pollution.

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

(c) Some people throw away plastic bottles. This can cause a litter problem.

Explain why throwing away plastic bottles can cause problems.

.....

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

[Total: 6]

5 Cracking is a process that is done in an oil refinery.

Look at the table of information about different fractions found in crude oil.

The fractions contain hydrocarbon molecules.

The fractions at the top of the table have smaller molecules than the fractions at the bottom.

fraction	amount supplied in crude oil in tonnes	amount needed in tonnes
liquefied petroleum gases	13	12
petrol	10	15
diesel	10	18
paraffin	25	20
heating oil	20	25
bitumen	22	10

Crude oil contains too much of some fractions and not enough of other fractions.

The manager of the oil refinery needs to make some decisions.

She needs to decide the conditions to use and the fractions to be cracked.

What conditions should the manager use and how does she use the information in the table to decide which fractions should be cracked?

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

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..... **[6]**

[Total: 6]

Section B – Module C2

6 This question is about metals.

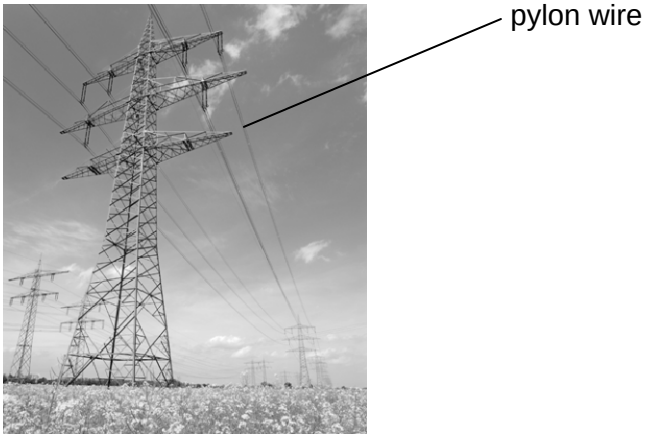
Look at the table. It shows the properties of some metals.

metal	melting point in °C	density in g/cm^3	relative electrical conductivity	cost per tonne in £
aluminium	660	2.7	40	1350
copper	1083	8.9	64	3800
iron	1535	7.9	11	400
silver	962	10.5	67	20 000

(a) Which metal would you chose to make a container in which to melt copper?

answer ..... **[1]**

(b) Pylon wires are made from metal.



Which metal would be most suitable for using for pylon wires?

Use information about each of the metals in the table to explain your answer.

.....

.....

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

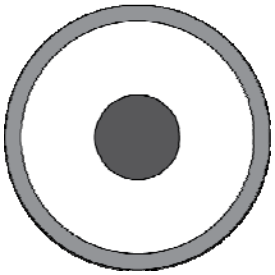
(c) Brass is made from copper and zinc.

Write down one use of brass.

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

[Total: 5]

7 Look at the diagram of the structure of the Earth.



The surface of the Earth is made up of tectonic plates.

(a) Describe the structure of the Earth and the effects of plate tectonics.

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

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..... **[6]**

(b) The theory of plate tectonics is widely accepted by scientists.

Give **two** reasons why.

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

[Total: 8]

8 This question is about the manufacture of ammonia.

Ammonia is made in the Haber process.

Look at the equation for the Haber process.

$$N_2 + 3H_2 \rightleftharpoons 2NH_3$$

(a) There are many different factors that affect the cost of making ammonia.

Look at the table about the costs of making 10 tonnes of ammonia in a factory.

factor	**cost in £**
energy	1000
hydrogen	250
nitrogen	50
others	100

(i) Nitrogen is a much cheaper raw material than hydrogen.

Suggest why.

.....

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

(ii) Calculate what percentage of the total cost of making ammonia is for energy.

Suggest why the energy costs are so high.

.....

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

(iii) The ammonia made during this reaction is quickly removed to prevent it breaking down.

What substances are made when ammonia breaks down?

Use the symbol equation to help you answer.

.....

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

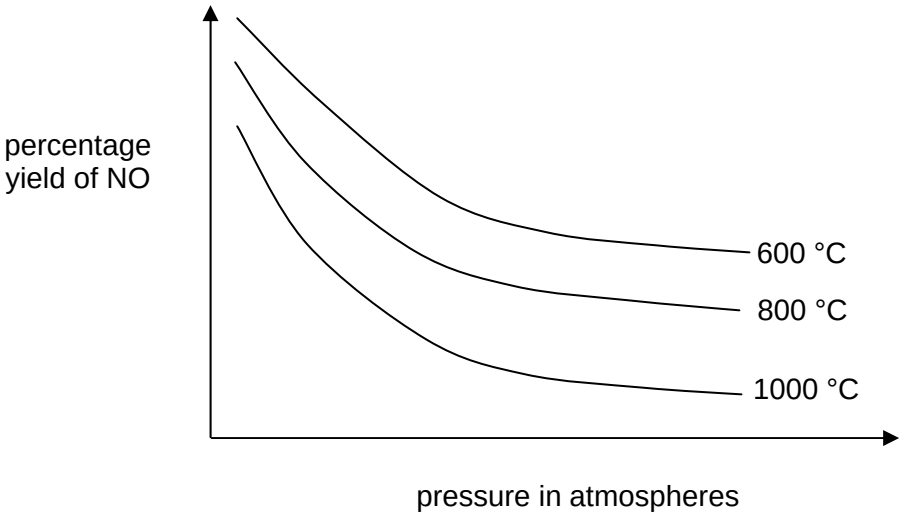
(b) Nitric acid is made from ammonia.

The first reaction in this process involves the oxidation of ammonia.

ammonia + oxygen $\rightleftharpoons$ nitrogen(II) oxide + water

Look at the sketch graph.

It shows the percentage yield of nitrogen(II) oxide (NO) at different temperatures and pressures.



(i) How does increasing the **temperature** change the percentage yield?

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

(ii) How does increasing the **pressure** change the percentage yield?

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

[Total: 6]

9 This question is about fertilisers.

Fertilisers can be made by **neutralisation**.

(a) Look at the equation for a neutralisation reaction to make a fertiliser.

$$2KOH + H_2SO_4 \rightarrow K_2SO_4 + H_2O$$

Write down the formula of one **reactant**.

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

(b) Sodium hydroxide reacts with phosphoric acid.

Construct the **word equation** for this reaction.

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

(c) Elizabeth is a farmer. She is given some ammonium sulfate to use on her fields.

Elizabeth is deciding whether or not to use the ammonium sulfate on her fields.

What factors should she consider?

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

(d) Elizabeth uses a bag of fertiliser that contains only ammonium sulfate, $(NH_4)_2SO_4$.

Anna uses a bag of fertiliser that is a mixture of potassium nitrate, KNO_3, and ammonium phosphate $(NH_4)_3PO_4$.

Suggest why Anna's bag of fertiliser is better than Elizabeth's.

.....

.....

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

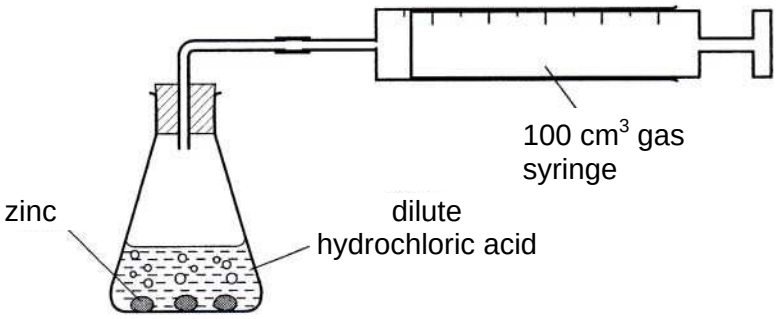
[Total: 6]

Section C – Module C3

10 Colin and Ann investigate the reaction between zinc lumps and hydrochloric acid.

Hydrogen and a solution of zinc chloride are made.

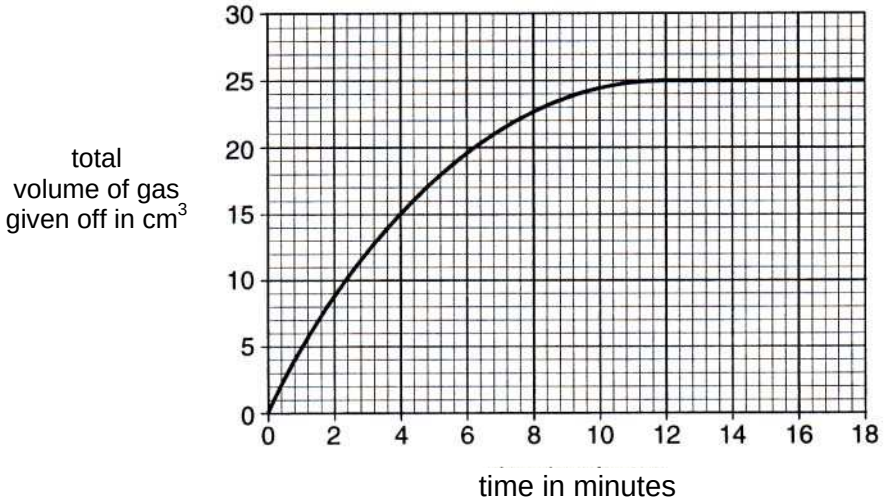
The diagram shows the apparatus they use.



Look at the graph.

It shows their results when 1 g of zinc lumps reacts with 20 cm^3 of dilute hydrochloric acid.

At the end of the experiment almost all of the zinc remained.



(a) How long does it take to make 20 cm^3 of gas?

..... minutes **[1]**

(b) Why does the reaction stop?

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

(c) Colin and Ann repeat the experiment.

This time they use **100** cm^3 of dilute hydrochloric acid rather than **20** cm^3.

Why would it be difficult to collect all of the hydrogen made at the end of this experiment?

.....

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

(d) Colin and Ann want the reaction to go faster.

They do not want to change the volume of acid or mass of zinc.

Explain, using the reacting particle model, two ways Colin and Ann can increase the rate of the reaction.

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

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..... **[6]**

(e) The reaction between zinc and hydrochloric acid goes at a reasonable rate.

Write down the name of one reaction which is **very slow** and one which is **very fast**.

.....

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

[Total: 12]

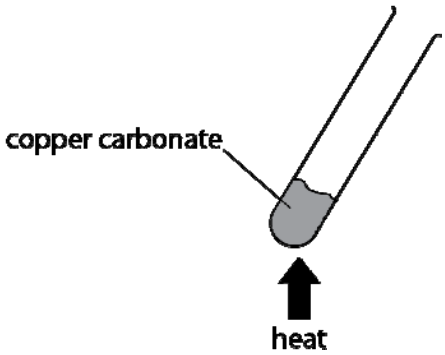
11 Copper carbonate decomposes when heated.

Copper oxide and carbon dioxide are made.

$$CuCO_3 \rightarrow CuO + CO_2$$

Tim investigates this decomposition.

Look at the apparatus he uses.



Tim heats 1.24 g of copper carbonate in the test-tube.

He uses a yellow Bunsen flame for 1 minute.

(a) Tim finds he only gets an 80% yield of copper oxide.

Suggest why he did not get a 100% yield.

.....

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

(b) Tim repeats his experiment using 1.24 g of copper carbonate.

He makes certain he gets a 100% yield.

This time he makes 0.80 g of copper oxide.

What mass of **carbon dioxide** can Tim make by heating 0.62 g of copper carbonate?

.....

.....

.....

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

(c) A factory manufactures copper oxide by heating copper carbonate.

The carbon dioxide made is a waste product.

(i) Look at the table of relative formula masses, M_r.

substance	relative formula mass, M_r
$CuCO_3$	
CuO	80
CO_2	44

The relative atomic mass for Cu is 64, for C is 12 and for O is 16.

Calculate the relative formula mass for copper carbonate.

Put your answer in the table.

.....

.....

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

(ii) Calculate the atom economy for the manufacture of copper oxide.

.....

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

(iii) A factory wants as high an atom economy as possible when making a chemical.

Explain why.

.....

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

(iv) The factory uses a batch process rather than a continuous process.

What is the difference between a batch process and a continuous process?

.....

.....

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

[Total: 9]

12 Diamond and graphite have different properties and different uses.

Look at the table.

It shows some information about the properties of diamond and graphite.

property	diamond	graphite
state at room temperature	solid	solid
appearance at room temperature	colourless, clear and lustrous	dull black
melting point	……..	very high
hardness	very hard	soft and slippery
solubility in water	insoluble	insoluble
electrical conductivity	……..	good conductor

(a) Complete the table by describing the

- melting point of diamond
- electrical conductivity of diamond. **[2]**

(b) Mark decides to use graphite electrodes in the electrolysis of sodium chloride solution.

Use information in the table and your own knowledge to give reasons for his decision.

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

[Total: 4]

[Paper Total: 75]

END OF QUESTION PAPER

PERIODIC TABLE

1	2											3	4	5	6	7	0
							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 **A***l* aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **C***l* 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 **T***l* 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						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

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