

GENERAL CERTIFICATE OF SECONDARY EDUCATION

GATEWAY SCIENCE

B641/01

CHEMISTRY B

Unit 1 Modules C1 C2 C3
(Foundation Tier)

Thursday 4 June 2009
Morning

Duration: 1 hour

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)



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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MODIFIED LANGUAGE

INSTRUCTIONS TO CANDIDATES

- Write your name clearly 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.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- 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 **60**.
- The Periodic Table is printed on the back page.
- This document consists of **20** pages. Any blank pages are indicated.

Answer **all** the questions.

Section A – Module C1

- 1 This question is about food additives.

Food additives are given E numbers to identify them.

Look at the table. It gives some information about E numbers.

E number range	type of food additive
E 100 to E 199	food colourings
E 200 to E 299	preservatives
E 300 to E 399	antioxidants
E 400 to E 600	flavour enhancers and emulsifiers

Look at part of the food label on a packet of sausages.

<p>Ingredients: Pork, Water, Pork Fat, E 412, E 450, E 223, E 300, E 307, E 120</p>
--

- (a) Which ingredient is present in the **smallest** amount?

Choose from the food label.

..... [1]

- (b) What type of additive is **E 450**?

..... [1]

- (c) The sausages contain the **antioxidant** E 300.

Explain why antioxidants are added to foods.

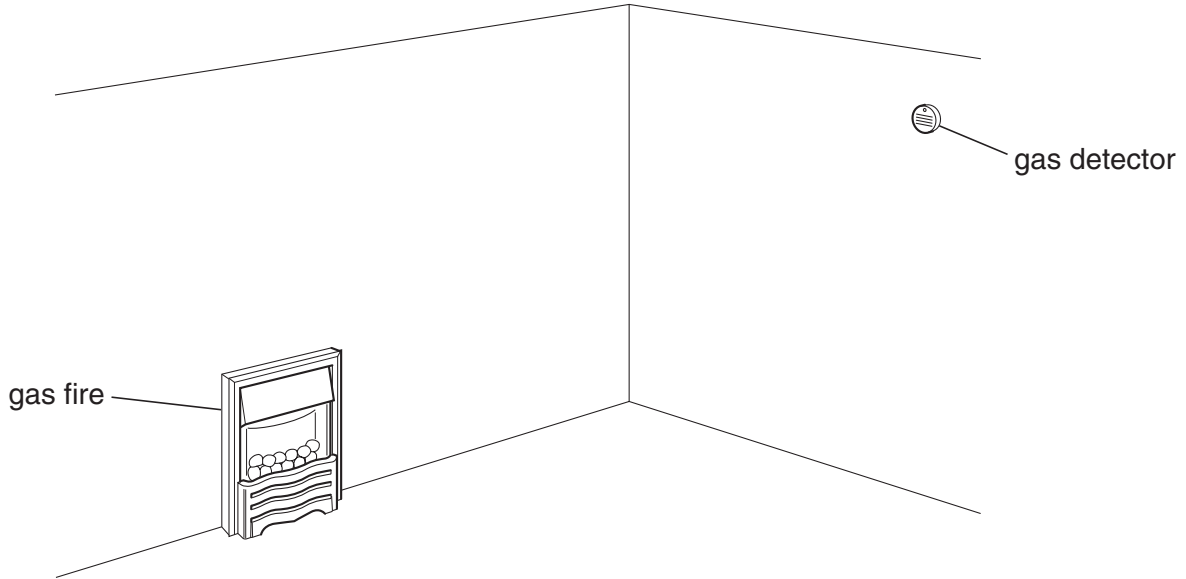
.....
..... [1]

[Total: 3]

2 This question is about the burning of fuels.

James and Anita move into a flat.

Look at the diagram of a room in the flat.



Look at the list of gases.

carbon dioxide

carbon monoxide

nitrogen

oxygen

water vapour

(a) The fire uses a fuel. The fuel reacts with a gas in the air.

Which gas?

Choose from the list.

..... [1]

(b) The gas detector shows if a poisonous gas is being made.

Write down the name of this **poisonous** gas.

Choose from the list.

..... [1]

[Total: 2]

Turn over

3 Look at the picture of a rose.



The rose has a very pleasant smell.

A perfume can be made from the oil in the rose.

The same perfume can be made in a laboratory. The perfume contains an ester.

(a) Colin makes this ester in a laboratory.

He adds an acid to an alcohol. Water is also made in this reaction.

(i) Write down the **word** equation for the making of this ester.

..... [1]

(ii) What is the name given to perfumes made in a laboratory?

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

active

natural

neutral

synthetic

[1]

(b) We can smell perfumes easily.

(i) Perfumes have a property that makes them easy to smell.

Which property?

..... [1]

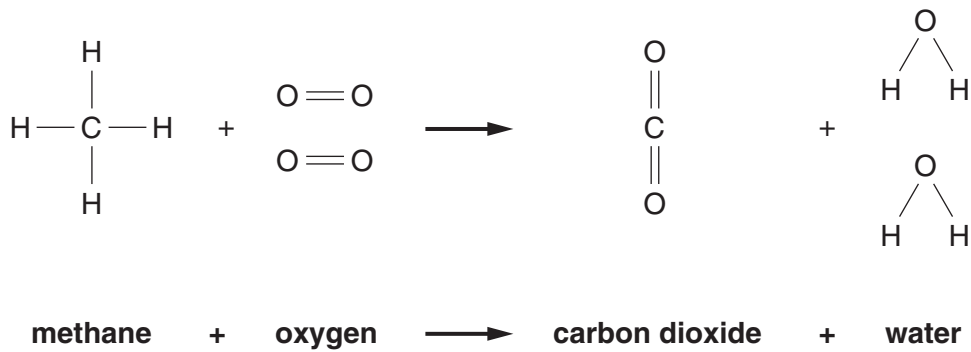
(ii) Some cells in our nose detect the smell of perfume.

What type of cell detects smells?

..... [1]

[Total: 4]

4 (a) Look at the equations. They show what happens when methane burns.



(i) Write down the name of one of the **reactants** in the equation.

..... [1]

(ii) Look at the displayed formula of methane in the equation.

Write down the **total** number of **atoms** in one molecule of methane.

answer [1]

(iii) Look at the displayed formula of carbon dioxide in the equation.

Write down the number of different **types** of atoms in carbon dioxide.

answer [1]

(b) Complete the sentence.

The burning of methane is an exothermic reaction.

Energy is the surroundings.

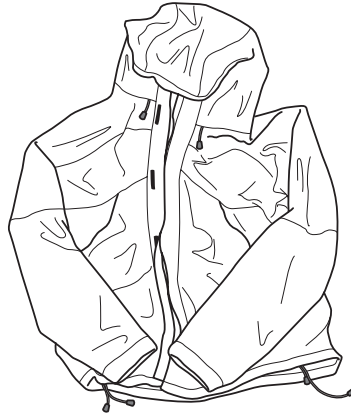
[1]

[Total: 4]

5 A special material called Gore-Tex® is used to make many outdoor clothes.

Jill buys a coat made of Gore-Tex®.

Look at the picture. It shows her coat.



Gore-Tex® has a number of useful properties.

Two of these properties are:

- it is waterproof
- it is breathable.

(a) Why do people wear **waterproof** clothing?

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

(b) Jill wears her Gore-Tex® coat when she goes climbing.

Gore-Tex® is breathable.

Describe one **advantage** of Gore-Tex® being breathable.

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

(c) Gore-Tex® is waterproof and breathable.

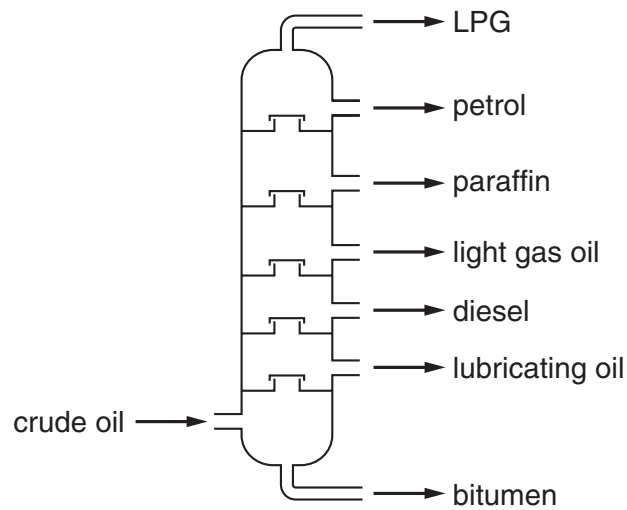
Describe **one other** useful property of Gore-Tex®.

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

[Total: 3]

- 6 Crude oil is separated into useful substances by fractional distillation.

Look at the diagram. It shows a fractionating column.



- (a) The LPG exits from the top of the fractionating column.

Explain why.

Use ideas about boiling points.

.....
 [1]

- (b) The petrol fraction contains octane, C_8H_{18} .

Octane is a **hydrocarbon**.

Explain why.

.....
 [2]

- (c) Describe **one** use for petrol.

.....
 [1]

[Total: 4]

Section B – Module C2

7 (a) Many materials are used to build houses.

Two of these are concrete and glass.

Write down two **other** materials used to build houses.

1

2 [2]

(b) Concrete is made by mixing cement, water and one other substance.

(i) Which other substance is added?

Choose from the list.

limestone

marble

salt

sand

answer [1]

(ii) Concrete can be reinforced. This makes it stronger.

How is concrete reinforced?

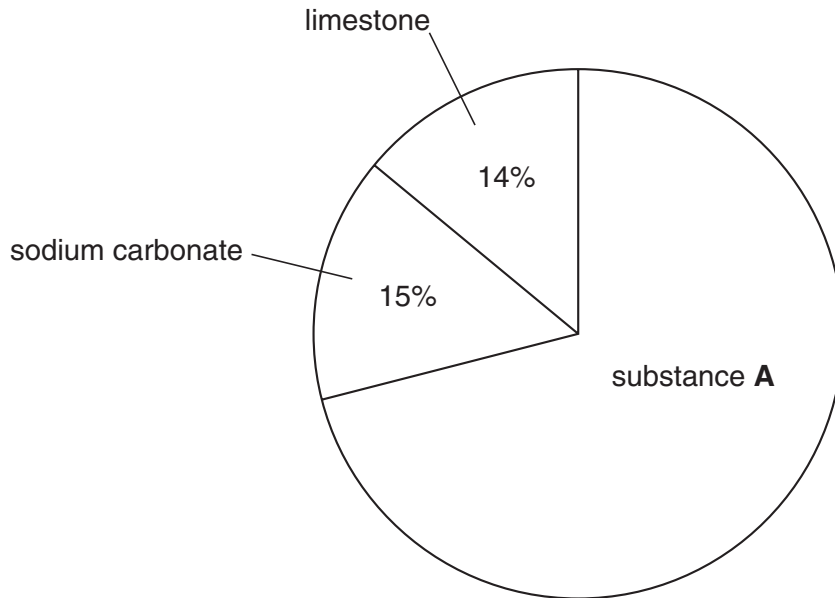
..... [1]

(c) Glass is made by mixing and heating three materials.

Two of them are sodium carbonate and limestone.

Look at the pie chart.

It shows the percentages of different materials used to make one type of glass.



(i) Write down the name of substance **A**.

..... [1]

(ii) Calculate the percentage of substance **A**.

..... [1]

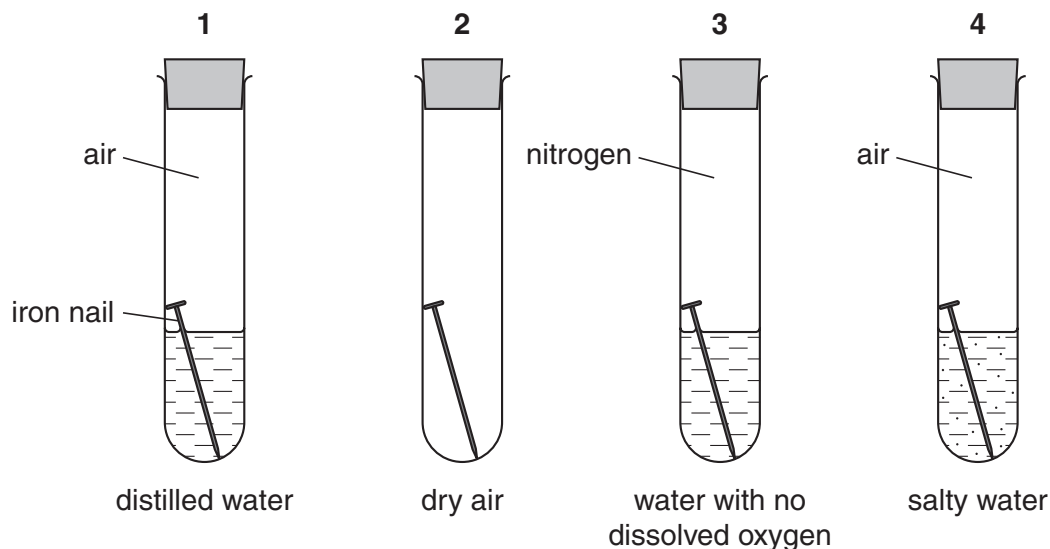
[Total: 6]

8 Nigel investigates the rusting of iron.

Look at the diagram.

It shows how he sets up his investigation.

Each test tube contains an iron nail.



After 2 weeks the nail in tube 1 was a bit rusty.

The nails in tubes 2 and 3 were not rusty.

The nail in tube 4 was very rusty.

(a) Two substances are needed for iron to rust.

Which **two** substances?

1

2 [2]

(b) What substance speeds up rusting?

..... [1]

(c) Nigel repeats the investigation using aluminium instead of iron.

Aluminium does not corrode in any of the experiments.

Explain why.

.....

 [2]

[Total: 5]

9 Look at the table.

It shows the concentration of some gases found in the atmosphere over the last 100 years.

year	concentration of oxides of nitrogen in parts per million	concentration of carbon dioxide in parts per million
1900	18	300
1920	18	305
1940	20	310
1960	25	320
1980	30	340
2000	35	370

(a) (i) How does the concentration of **oxides of nitrogen** change from 1900 to 2000?

..... [1]

(ii) Suggest what the concentration of **carbon dioxide** might be in the atmosphere in the year 2020.

concentration parts per million

Explain your answer.

.....
 [1]

(b) Oxides of nitrogen are pollutants in the air.

Where do the oxides of nitrogen come from?

.....
 [1]

(c) Sulfur dioxide is another gas that pollutes the air.

It is made when sulfur impurities in fossil fuels burn.

What environmental problem can sulfur dioxide cause?

..... [1]

[Total: 4]

10 John reacts calcium carbonate with hydrochloric acid.

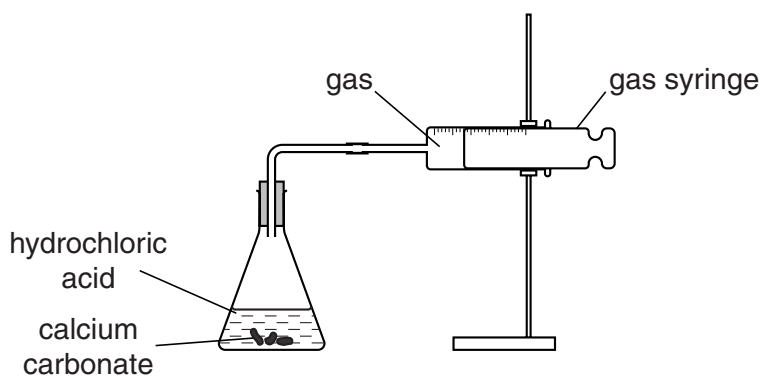
Carbon dioxide gas is made and collected.

He does the experiment twice.

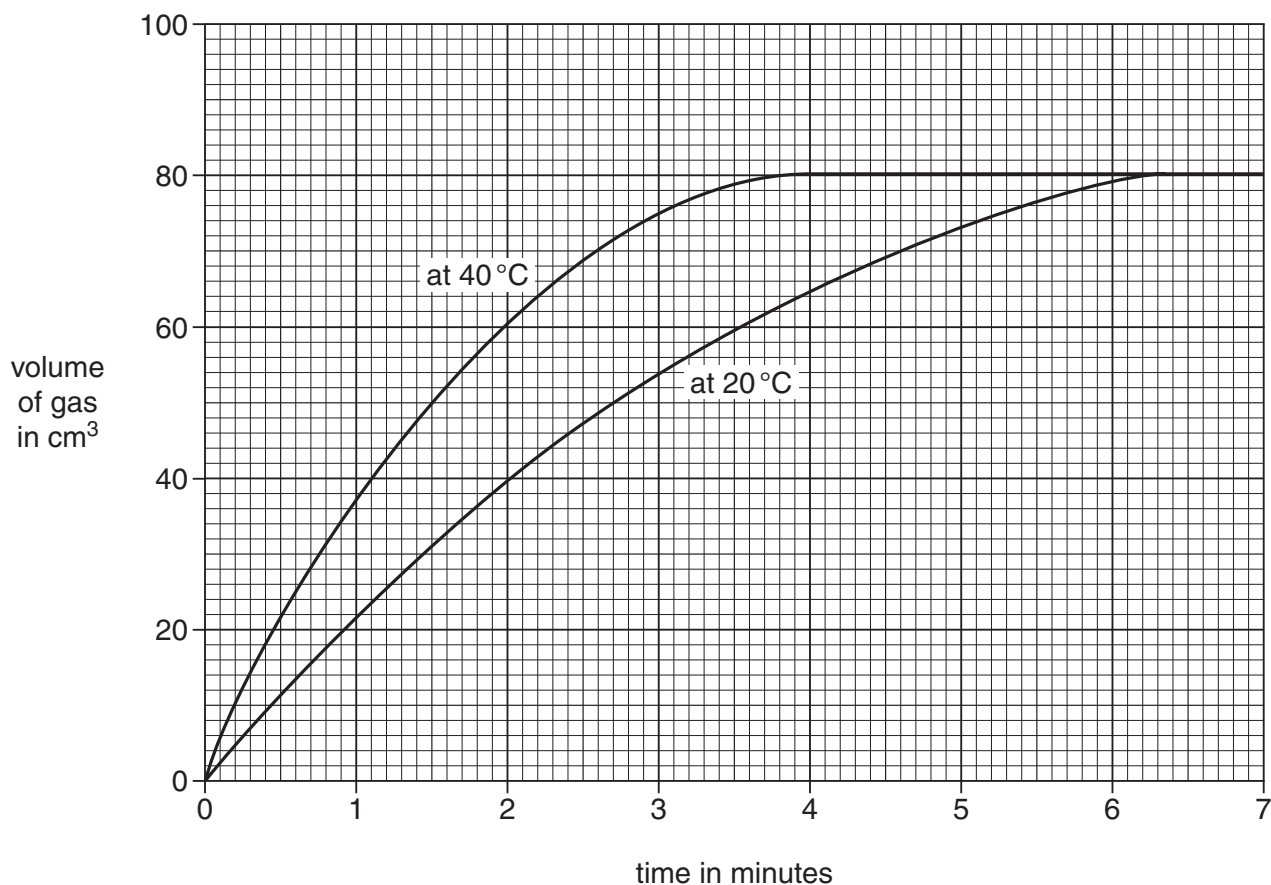
He uses the same amount of each chemical.

In the first experiment the acid is at 20 °C.

In the second experiment the acid is at 40 °C.



(a) Look at the graph. It shows his results.



(i) Both reactions give the same final volume of gas.

What is the final volume of gas?

..... cm³

[1]

(ii) Complete the sentence.

At 2 minutes the reaction at 40 °C has made 60 cm³ of gas.

At 2 minutes the reaction at **20 °C** has made cm³ of gas. [1]

(iii) Which reaction is faster, the one at 20 °C or at 40 °C?

.....

Use the **graph** to explain your answer.

..... [1]

(b) Suggest why the reaction stops.

..... [1]

(c) Increasing the temperature is one way of speeding up a reaction.

Write down one **other** way of speeding up a reaction.

..... [1]

[Total: 5]

Section C – Module C3

11 This question is about the uses of different elements.

Draw a straight line to join each **element** to its **use**.

element	use
chlorine	building bridges
copper	sterilising cuts and wounds
iodine	making electrical wires
iron	making pesticides and plastics

[3]

[Total: 3]

12 Copper and iron are transition elements.

All the transition elements are metals.

(a) Write down the name or symbol of **one other** transition element.

Use the Periodic Table on the back page to help.

..... [1]

(b) High tensile strength is one physical property of metals.

Write about **other** physical properties of metals.

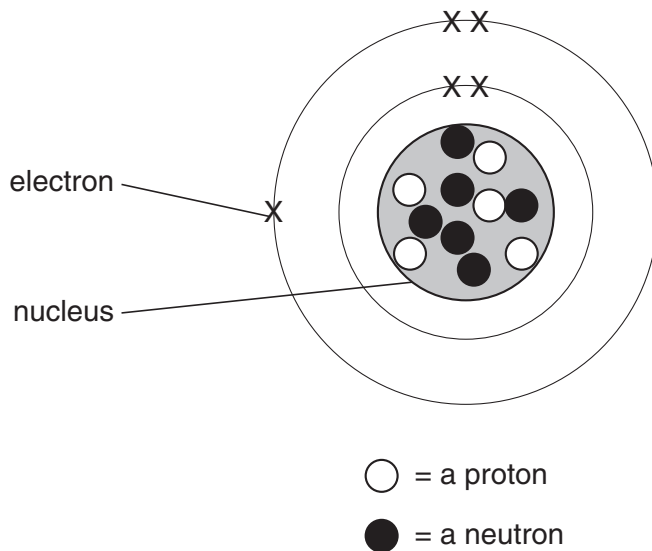
.....
.....
.....
.....
..... [3]

[Total: 4]

13 This question is about atomic structure.

Look at the diagram.

It shows the structure of an atom.



(a) What is the **atomic** number of this atom?

.....

[1]

(b) What is the **mass** number of this atom?

.....

[1]

(c) An element is made up of these atoms.

(i) Which **group** of the Periodic Table is this element in?

.....

[1]

(ii) Which **period** of the Periodic Table is this element in?

.....

[1]

[Total: 4]

14 Sodium is an alkali metal.

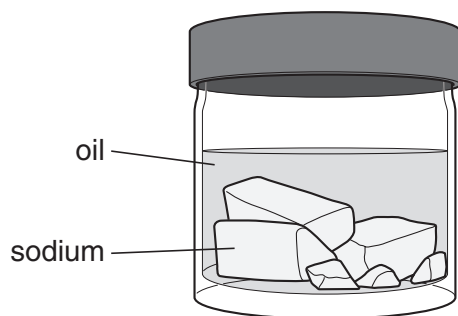
It is in Group 1 of the Periodic Table.

(a) Write down the name or symbol of **one other** alkali metal.

..... [1]

(b) Look at the diagram.

It shows how sodium is stored in a bottle.



The sodium is covered with oil. The oil stops sodium reacting with water.

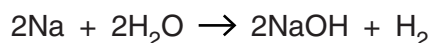
Write down one **other** reason why sodium must be stored under oil.

.....
 [1]

(c) Sodium reacts with cold water.

A colourless gas and an alkaline solution are made.

Look at the balanced symbol equation for this reaction.



(i) What is the **name** of the colourless gas made?

..... [1]

(ii) What is the **name** of the alkaline solution made?

..... [1]

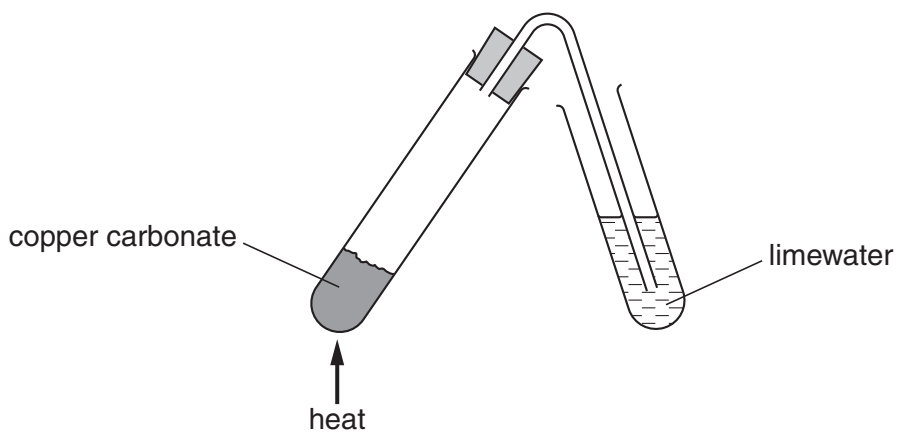
[Total: 4]

15 Beth investigates the thermal decomposition of copper carbonate.

Look at the word equation for this decomposition.



Look at the diagram. It shows the apparatus she uses.



She measures the mass of the copper carbonate before heating.

She also measures the mass of the copper oxide after heating.

Look at her results.

	mass in grams
copper carbonate before heating	2.21
copper oxide after heating	1.43

(a) What is the mass of carbon dioxide made?

..... g [1]

(b) The carbon dioxide is bubbled through the limewater.

Describe what happens to the limewater.

..... [1]

(c) What is meant by **thermal decomposition**?

..... [1]

(d) Beth uses the internet to find out about other metal carbonates.

She finds out the temperature needed to decompose different carbonates.

Look at the table. It shows these temperatures.

carbonate	temperature needed to decompose carbonate in °C
copper carbonate	375
iron(III) carbonate	-25
manganese carbonate	500
zinc carbonate	400

(i) Which carbonate needs the **highest** temperature to decompose?

Choose from the carbonates in the table.

answer [1]

(ii) Most carbonates need to be heated before they will decompose.

Which carbonate will decompose **without** being heated by a Bunsen burner?

Choose from the carbonates in the table.

answer [1]

[Total: 5]

END OF QUESTION PAPER

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The Periodic Table of the Elements

1	2	3	4	5	6	7	0	
7 Li lithium 3	9 Be beryllium 4	11 Na sodium 11	12 C carbon 6	13 Al aluminium 13	14 N nitrogen 7	15 O oxygen 8	16 F fluorine 9	17 Ne neon 10
19 K potassium 19	20 Ca calcium 20	23 V vanadium 23	24 Cr chromium 24	25 Mn manganese 25	26 Fe iron 26	27 Co cobalt 27	28 Ni nickel 28	29 Cu copper 29
37 Rb rubidium 37	38 Sr strontium 38	39 Y yttrium 39	40 Zr zirconium 40	41 Nb niobium 41	42 Mo molybdenum 42	43 Tc technetium [98]	44 Ru ruthenium 44	45 Rh rhodium 45
55 Cs caesium 55	56 Ba barium 56	57 La* lanthanum 57	72 Hf hafnium 72	73 Ta tantalum 73	74 W tungsten 74	75 Re rhenium 75	76 Os osmium 76	77 Ir iridium 77
87 Fr francium 87	88 Ra radium 88	89 Ac* actinium 89	104 Rf rutherfordium 104	105 Db dubnium 105	106 Sg seaborgium 106	107 Bh bohrium 107	108 Hs hassium 108	109 Mt meitnerium 109
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
209 Bi bismuth 83	207 Pb lead 82	204 Tl thallium 81	201 Hg mercury 80	197 Au gold 79	195 Pt platinum 78	192 Rh rhodium 45	186 Re rhenium 75	184 W tungsten 74
85 At astatine 85	84 Po polonium 84	83 Bi bismuth 83	82 Pb lead 82	81 Tl thallium 81	80 Hg mercury 80	79 Se selenium 34	78 Br bromine 35	77 I iodine 53
86 Rn radon 86	86 Rn radon 86	86 Rn radon 86	86 Rn radon 86	86 Rn radon 86	86 Rn radon 86	86 Rn radon 86	86 Rn radon 86	86 Rn radon 86

1 H hydrogen 1

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.

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