

**GENERAL CERTIFICATE OF SECONDARY EDUCATION
GATEWAY SCIENCE
CHEMISTRY B**

B642/01

Unit 2 Modules C4 C5 C6 (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)

**Wednesday 15 June 2011
Morning**

Duration: 1 hour



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. Pencil may be used for graphs and diagrams only.
- 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).
- Answer **all** the questions.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

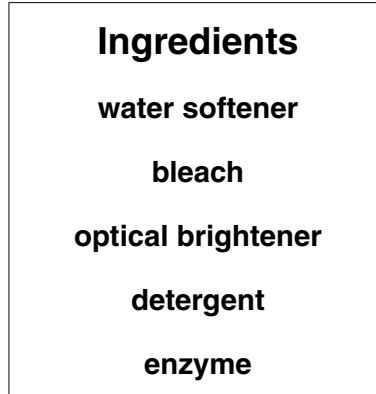
- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **60**.
- The Periodic Table is printed on the back page.
- This document consists of **28** pages. Any blank pages are indicated.

Answer **all** the questions.

Section A – Module C4

1 Washing powder is used to clean clothes.

Look at the label on a box of biological washing powder.



(a) (i) One ingredient helps to give clothes a 'whiter than white' appearance.

Which ingredient?

..... [1]

(ii) What is the job of the bleach in the washing powder?

..... [1]

(b) Milly investigates a biological washing powder.

Milly does several experiments.

Each time she adds washing powder to 1000 cm³ of water.

She puts a tea-towel with a food stain into the water.

She times how long it takes for the food stain to be removed.

Milly then changes the temperature of the water and the mass of washing powder she uses.

Look at her table of results.

		mass of washing powder used		
		10g	30g	50g
temperature of water	15 °C	25 min	20 min	15 min
	35 °C	10 min	8 min	4 min
	55 °C	15 min	10 min	6 min

Write down **two** conclusions Milly can make from these results.

.....

.....

.....

..... [2]

(c) Write down one **advantage** of using a low temperature wash.

.....

..... [1]

[Total: 5]

2 Sea water contains many useful chemicals.

Ed uses the internet to find out the ions found in sea water.

Look at the table of information that Ed finds.

name of ion	formula of ion	percentage of dissolved ion in sea water
bromide	Br^-	0.2%
calcium	Ca^{2+}	1.2%
chloride	Cl^-	55.0%
magnesium	Mg^{2+}	3.7%
potassium	K^+	1.1%
sodium	Na^+	30.6%
sulfate	SO_4^{2-}	7.7%

(a) Which **positive** ion is present in the **greatest** amount in sea water?

Choose from the table.

..... [1]

(b) Which solution is used to test for chloride ions in sea water?

Choose from the list.

ammonium sulfate

hydrochloric acid

potassium nitrate

silver nitrate

answer [1]

(c) Barium chloride solution reacts with the sulfate ions in sea water.

A precipitate is made.

What is the colour of the precipitate?

Choose from the list.

blue

green

pale yellow

white

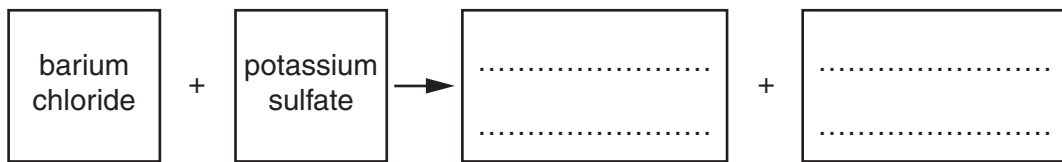
answer [1]

(d) Barium chloride solution reacts with potassium sulfate solution.

This is a precipitation reaction.

Look at the word equation for this precipitation reaction.

Finish the word equation.



[1]

(e) In some parts of the world sea water is used to make clean water for drinking.

It is important that people in all parts of the world have a supply of clean water.

Explain why.

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

[Total: 5]

3 Stowmarket Synthetics own a chemical factory.

They want to make hydrogen peroxide.

Hydrogen peroxide can be made by two methods.

One method is a **batch** process and one is a **continuous** process.

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

.....

.....

..... [1]

(b) Look at the table.

It gives some information about the two methods used to make hydrogen peroxide.

	method 1	method 2
starting materials	barium peroxide and sulfuric acid	hydrogen and oxygen
temperature	5 °C	45 °C
catalyst	none needed	catalyst needed
percentage yield	70%	95%
pollution problems	poisonous waste product made	no waste products made

There are many costs involved in making hydrogen peroxide.

One of these is the cost of energy.

Write down two **other** costs of making hydrogen peroxide.

1

.....

2.....

..... [2]

(c) Stowmarket Synthetics also make medicines.

They extract chemicals from the leaves of a plant.

They use these chemicals as the starting material.



Write about how chemicals can be extracted from plants.

.....

.....

.....

..... [2]

[Total: 5]

4 Dylan is a farmer.

He uses fertilisers to make his plants grow faster and bigger.

Fertilisers contain one or more of the three **essential elements**.

These essential elements are nitrogen, phosphorus and potassium.

Look at the diagram. It shows the bags of fertiliser that Dylan has bought.



(a) How many of the **essential elements** are there in this fertiliser?

..... [1]

(b) Dylan puts this fertiliser on his fields.

How does this fertiliser enter the plants?

..... [1]

(c) Ammonium phosphate is a fertiliser made from ammonia.

(i) Which one of these fertilisers is also made from ammonia?

Choose from the list.

ammonium sulfate

phosphorus (V) oxide

potassium phosphate

potassium sulfate

answer..... [1]

(ii) A solution of ammonium phosphate has a pH of 5.5.

What does this tell you about ammonium phosphate solution?

..... [1]

(d) Urea is another fertiliser that can be made from ammonia.

Urea has the formula $(\text{NH}_2)_2\text{CO}$.

What is the relative formula mass, M_r , for urea?

The relative atomic mass, A_r , of N is 14, of H is 1, of C is 12 and of O is 16.

.....
.....
.....

relative formula mass = [1]

[Total: 5]

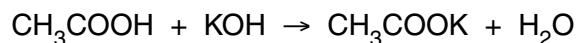
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Section B – Module C5

5 Kim investigates the neutralisation reaction between ethanoic acid and potassium hydroxide.

(a) Look at the symbol equation for this reaction.



(i) Write down the formula of the **salt** in this reaction.

..... [1]

(ii) Kim uses a solution of potassium hydroxide, KOH, in water.

What is the correct state symbol for a solution of KOH in water?

Choose from the list.

(aq)

(g)

(l)

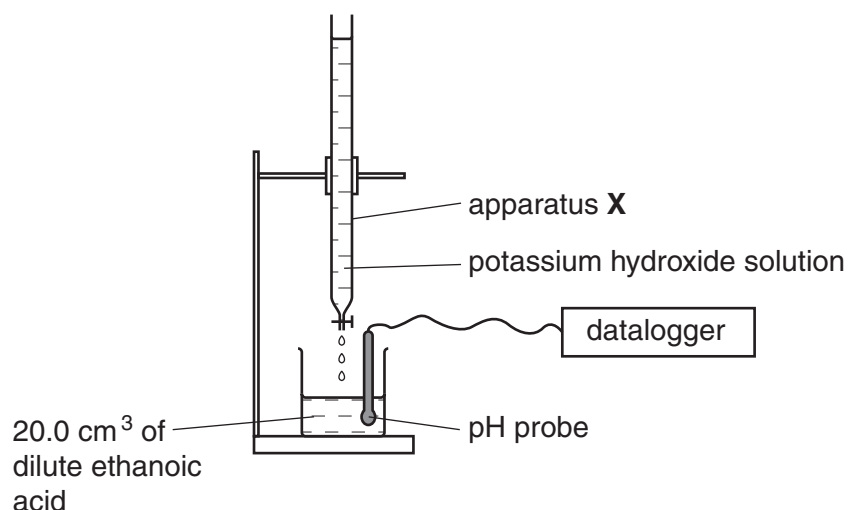
(s)

answer

[1]

(b) Kim slowly adds potassium hydroxide solution to the dilute ethanoic acid.

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

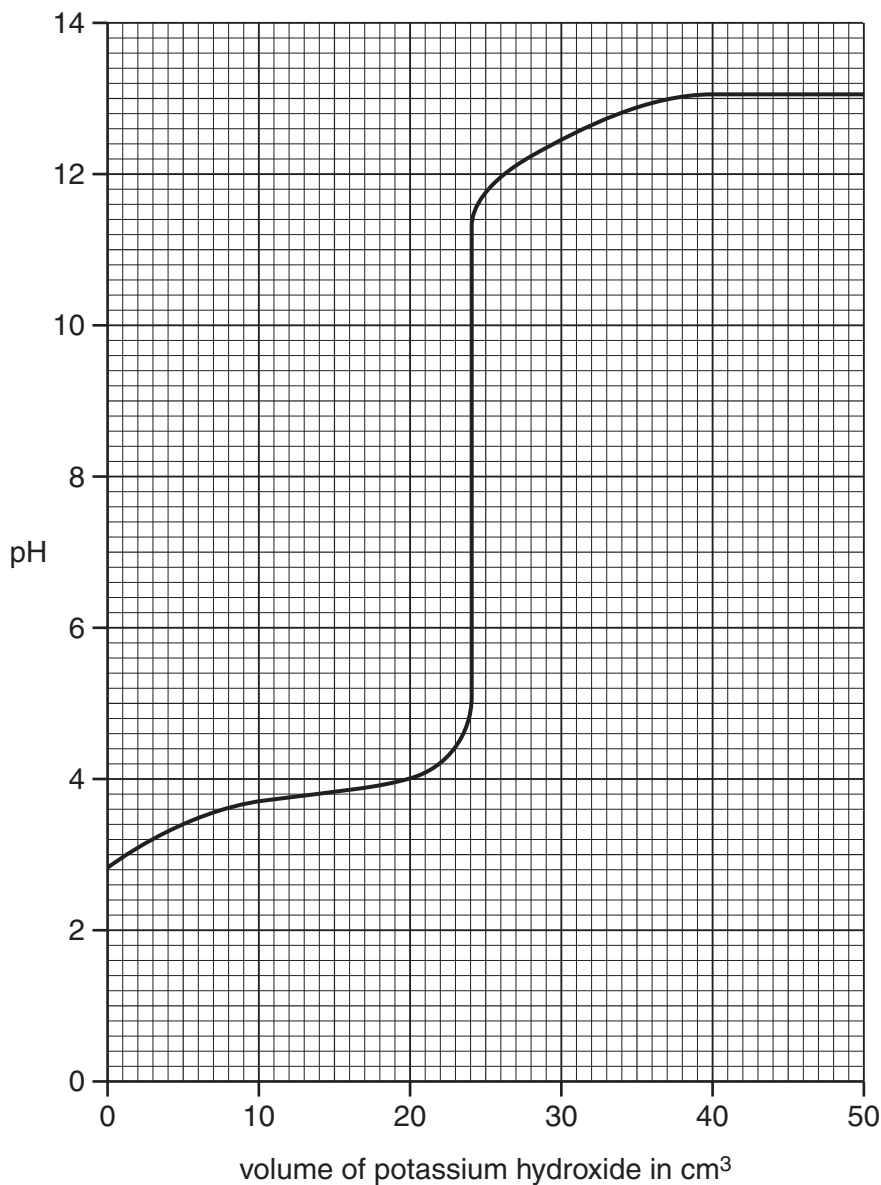


What is the name of apparatus **X**?

..... [1]

(c) Kim uses a pH probe (pH meter) to find the pH of the solution in the beaker.

Look at the graph. It shows how the pH of the solution in the beaker changes as more potassium hydroxide solution is added.



(i) Kim adds 10.0 cm³ of potassium hydroxide solution.

What is the pH of the solution in the beaker?

..... [1]

(ii) What volume of potassium hydroxide must be added to just neutralise the ethanoic acid?

..... cm³ [1]

(d) Kim repeats the investigation.

This time she uses phenolphthalein to tell when the ethanoic acid has been neutralised.

Phenolphthalein is an indicator.

Finish the sentences about phenolphthalein.

Choose words from the list.

blue

colourless

green

pink

yellow

In acid, phenolphthalein is

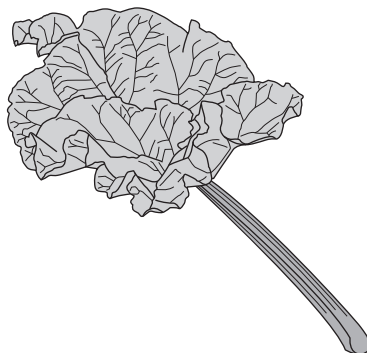
In alkali, phenolphthalein is

[2]

[Total: 7]

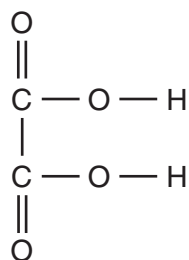
6 Chen is a research chemist.

He extracts a poisonous acid from rhubarb leaves.



The name of the acid is oxalic acid.

Look at the displayed formula for oxalic acid.



(a) What is the molecular formula for oxalic acid?

.....

[1]

(b) Oxalic acid is a weak acid.

Oxalic acid ionises in water.

Which one of these ions is made?

Choose from the list.



answer

[1]

(c) Suggest **one** property of hydrochloric acid which is different from oxalic acid.

..... [1]

(d) Ethanoic acid is another weak acid.

Dilute ethanoic acid can be used to descale kettles.

This is because ethanoic acid reacts with the calcium carbonate (limescale).

(i) A gas is made when ethanoic acid reacts with calcium carbonate.

Which gas?

..... [1]

(ii) Hydrochloric acid is not used to descale kettles.

Explain why.

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

[Total: 5]

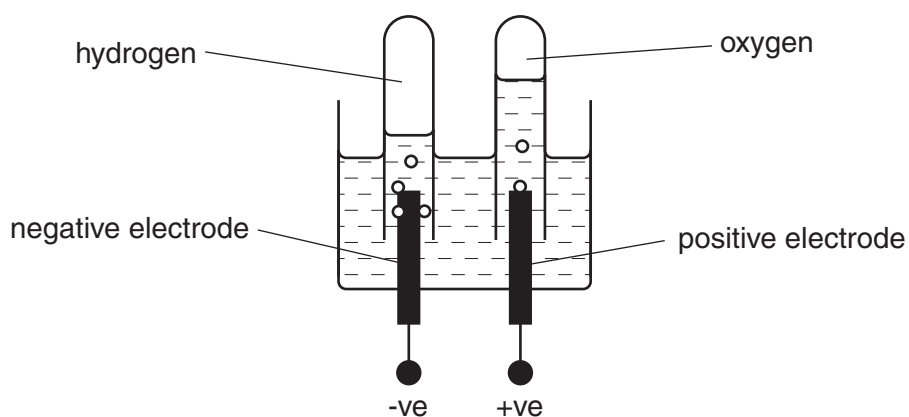
7 Electrolysis is a type of chemical reaction.

During electrolysis, an electric current is passed through a liquid.

The liquid is broken down (decomposed).

(a) Cameron investigates the electrolysis of potassium sulfate solution.

Look at the apparatus he uses.



(i) The positive electrode is called the anode.

What is the negative electrode called?

..... [1]

(ii) Potassium sulfate solution contains the following particles.



One ion reacts (is discharged) at the positive electrode.

Which ion?

Choose from the list.

answer

[1]

(b) Cameron uses the internet to find out about the electrolysis of melted solids.

Look at the table. It shows some of the information he finds.

melted solid	product made at the negative electrode	product made at the positive electrode
aluminium oxide	aluminium	oxygen
lead bromide	lead	bromine
potassium chloride

What are the products of the electrolysis of melted potassium chloride?

Write your answers in the table.

[2]

[Total: 4]

8 Sulfuric acid, H_2SO_4 , is made by the Contact Process.

Write about the Contact Process.

You may include

- the names of the raw materials used
- the chemical reactions that happen
- the conditions used.

.....

.....

.....

..... [2]

[Total: 2]

9 Potassium superoxide is used to provide emergency supplies of oxygen in submarines.

Look at the word equation.

It shows the reaction of potassium superoxide that makes oxygen.



Anthony reacts 71 g of potassium superoxide with 22 g of carbon dioxide.

He finds that 69 g of potassium carbonate is made.

What mass of oxygen is made at the same time?

.....

.....

.....

mass of oxygen = g

[2]

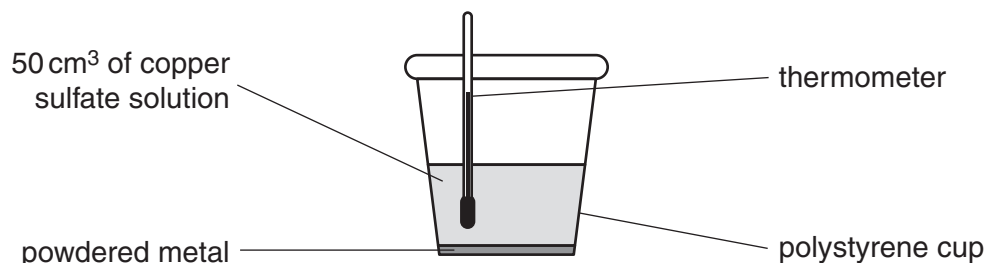
[Total: 2]

Section C – Module C6

10 This question is about the reactivity of metals.

(a) Amanda and Ken investigate the reactivity of iron, magnesium, tin and zinc.

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



Look at their table of results.

metal	starting temperature in °C	highest temperature in °C	temperature rise in °C
iron	20	52	32
magnesium	21	71	50
tin	22	41	
zinc	19	60	41

(i) Calculate the temperature rise for tin.

Write your answer in the table.

[1]

(ii) Zinc reacts with copper sulfate solution to make copper.

A solution of zinc sulfate is also made.

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

..... [1]

(b) Write down iron, magnesium, tin and zinc in order of reactivity.

most reactive metal

.....

.....

least reactive metal

[1]

(c) Oil and grease are used to prevent rusting of iron.

Write down **two** other ways that can be used to prevent iron rusting.

1

.....

2

..... [2]

[Total: 5]

11 This question is about oils and fats.

(a) Look at the pictures.



butter, a fat



olive oil, an oil

Fats and oils are the same type of chemical.

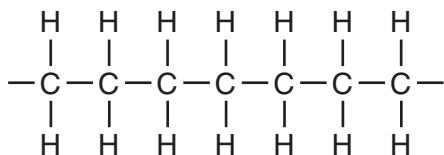
What is the difference between fats and oils at room temperature?

.....
 [1]

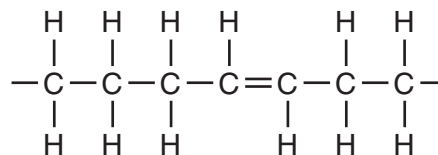
(b) (i) Butter contains saturated and unsaturated fats.

Fats **A** and **B** are both found in butter.

Look at parts of the structures of fats **A** and **B**.



fat **A**



fat **B**

Fat **B** is unsaturated.

How can you tell from its structure?

..... [1]

(ii) Jill wants to find out if olive oil is unsaturated.

Write about the experiment she does.

Your answer should include

- the chemical she uses
- any colour change.

.....

.....

.....

..... [2]

(c) Adam shakes olive oil with water. The oil does not dissolve in the water.

The tiny droplets of oil spread throughout the water.

What is the name of this type of mixture?

Choose from the list.

alloy

emulsion

precipitate

resin

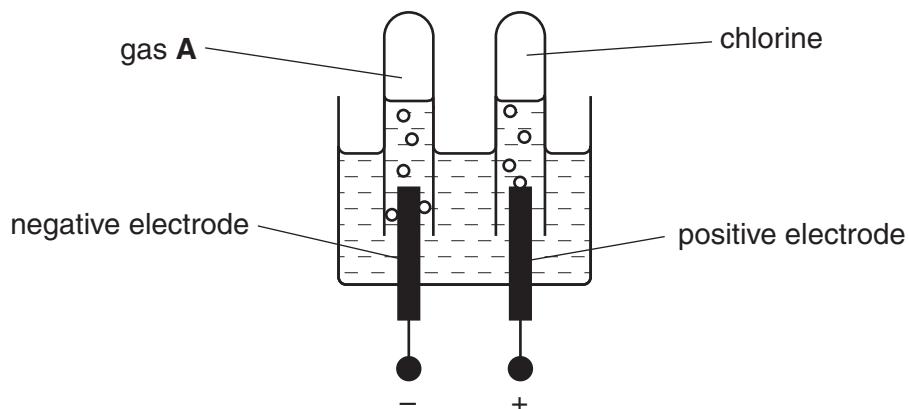
solution

answer [1]

[Total: 5]

12 (a) Sarah investigates the electrolysis of concentrated sodium chloride solution.

Look at the apparatus she uses.



Bubbles of gas are made at both electrodes.

Sarah tests the gases.

Look at her results.

name of gas	test	observations
gas A is	light gas with a lighted splint	squeaky pop
chlorine	hold moist litmus paper in gas

Complete the table by

- writing in the name of gas **A**
- describing what happens to the moist litmus paper.

[2]

(b) Sodium chloride is an important raw material.

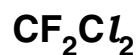
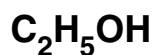
The electrolysis of molten sodium chloride makes chlorine gas.

Write down one large-scale use of chlorine gas.

answer [1]

[Total: 3]

13 Look at the molecular formulas of some compounds.



(a) (i) The compound CF_2Cl_2 is an example of a chlorofluorocarbon.

Write down the **names** of the elements in this compound.

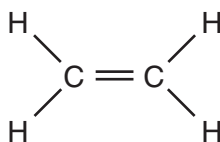
The Periodic Table may help you.

..... [1]

(ii) Write down the total number of **atoms** in a molecule of $\text{C}_2\text{H}_5\text{OH}$.

answer [1]

(iii) Look at the **displayed** formula of ethene, C_2H_4 .



Draw the **displayed** formula of ethanol, $\text{C}_2\text{H}_5\text{OH}$.

[1]

(b) Ethanol is made from ethene.



Write down the name of this **type** of reaction.

Choose from the list.

dehydration

electrolysis

fermentation

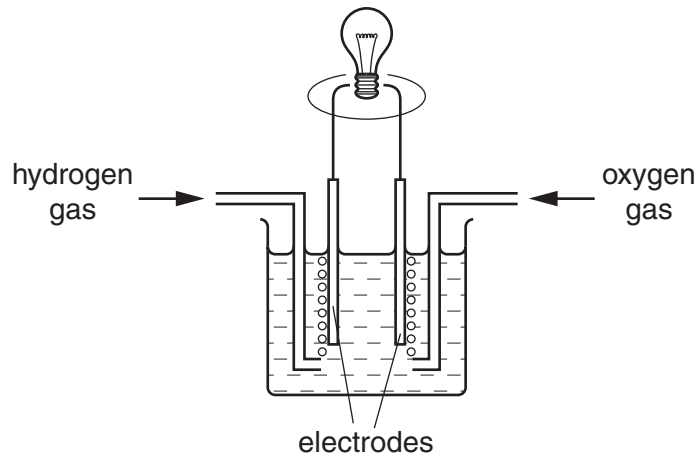
hydration

answer [1]

[Total: 4]

14 This question is about fuel cells.

The diagram shows how a fuel cell works.



(a) Fuel cells produce energy.

Look at the list. It shows different types of energy.

electrical

heat

kinetic

sound

Write down the name of the **main** type of energy made in a fuel cell.

Choose from the list.

answer [1]

(b) Look at the word equation for the reaction in this fuel cell.



Petrol and fuel cells can both be used to power cars.

Burning petrol makes carbon dioxide and water.

Write down **one** reason why using a fuel cell is better for the environment than burning petrol.

.....
 [1]

(c) Fuel cells are used in spacecraft instead of batteries.

Write down **one** advantage of using fuel cells instead of batteries.

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

[Total: 3]

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 P phosphorus 15	16 O oxygen 8	17 F fluorine 9	18 Ne neon 10								
19 K potassium 19	20 Ca calcium 20	21 Sc scandium 21	22 Ti titanium 22	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	30 Zn zinc 30	31 Ga gallium 31	32 Ge germanium 32	33 As arsenic 33	34 Se selenium 34	35 Br bromine 35	36 Kr krypton 36
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 43	44 Ru ruthenium 44	45 Rh rhodium 45	46 Pd palladium 46	47 Ag silver 47	48 Cd cadmium 48	49 In indium 49	50 Sn tin 50	51 Sb antimony 51	52 Te tellurium 52	53 I iodine 53	54 Xe xenon 54
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	78 Pt platinum 78	79 Au gold 79	80 Hg mercury 80	81 Tl thallium 81	82 Pb lead 82	83 Bi bismuth 83	84 Po polonium 84	85 At astatine 85	86 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						

1 H hydrogen 1

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.

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