

Surname	Centre Number	Candidate Number
Other Names		0



GCSE – NEW

C410U20-1



CHEMISTRY – Component 2
Applications in Chemistry

FOUNDATION TIER

WEDNESDAY, 13 JUNE 2018 – MORNING

1 hour 15 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	5	
2.	6	
3.	10	
4.	7	
5.	11	
6.	6	
7.	15	
Total	60	

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ADDITIONAL MATERIALS

In addition to this examination paper you will need a:

- calculator and ruler;
- **Resource Booklet.**

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

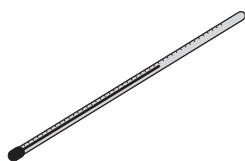
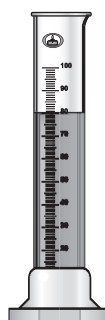
The number of marks is given in brackets at the end of each question or part-question.

Question **6** is a quality of extended response (QER) question where your writing skills will be assessed.

The Periodic Table is printed on the back cover of this paper and the formulae for some common ions on the inside of the back cover.

SECTION A*Answer all questions.*

1. (a) Some common pieces of laboratory apparatus are shown below.

**A****B****C****D****E****F**

Give the letter, **A-F**, of the piece of apparatus that would be used to measure

reaction time

pH value

an exact volume of liquid

[2]

- (b) The names of some separation methods used in chemistry are given in the box.

evaporation	filtration	chromatography
distillation	crystallisation	

A sample of sea water contains sand and salt solution.

Choose from the box the **most suitable** method to collect

sand from salt solution

water from salt solution

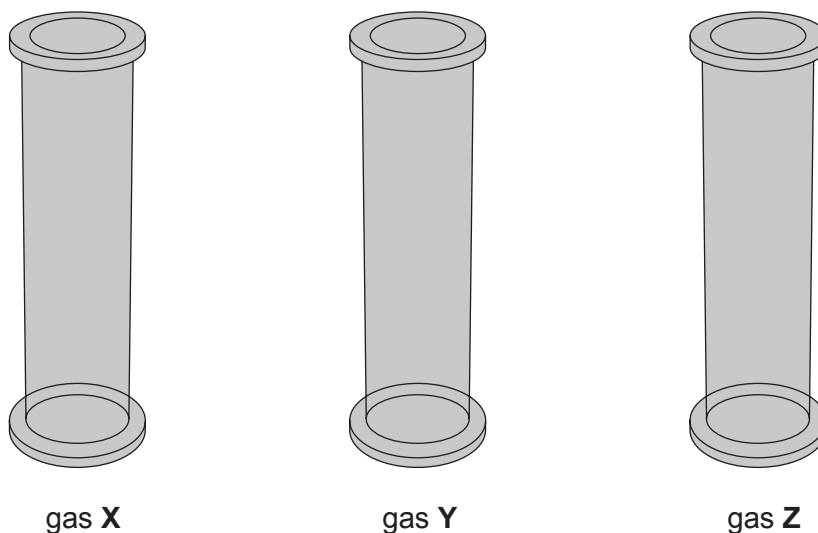
salt from salt solution

[3]

5

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2. Kelsey and Eve were given three identical gas jars each containing a different gas. They carried out simple chemical tests to identify these gases. The results of these tests are given below.



Test	Observation		
	Gas X	Gas Y	Gas Z
put a glowing splint into the gas	relights	glowing stops	glowing stops
put a lit splint into the gas	burns more brightly	makes a squeaky pop	flame goes out

- (a) Give the name of gas X and gas Y.

[2]

Gas X

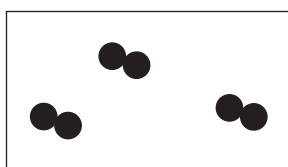
Gas Y

(b) They predict that gas **Z** is either carbon dioxide or ammonia.

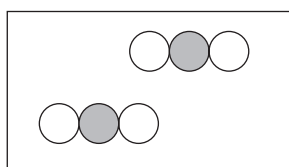
(i) Complete the table to describe the additional tests they would need to carry out to identify each of these gases. [2]

Gas	Test they would carry out	Expected observation
carbon dioxide	goes milky
ammonia	add damp red litmus paper

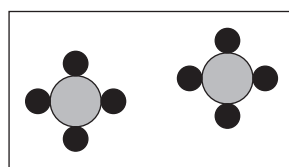
(ii) The following diagrams show the arrangement of atoms in different gases.



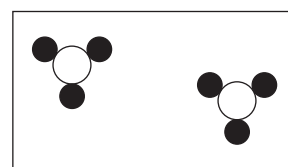
A



B



C



D

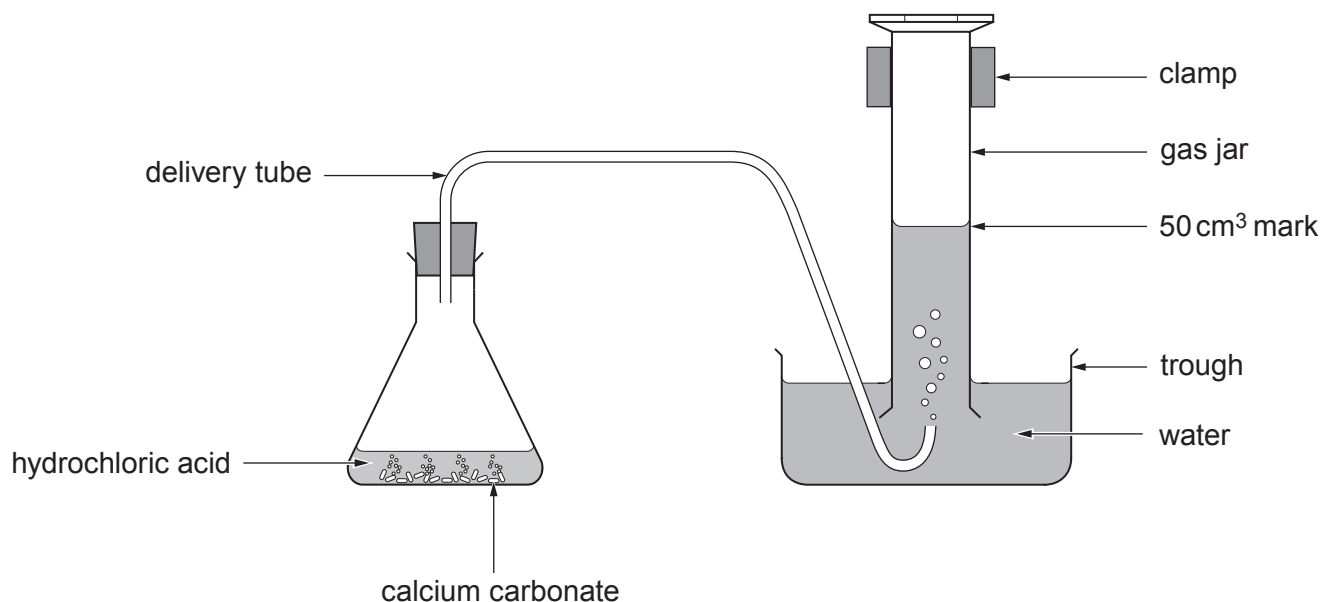
Give the **letter** of the diagram that represents

carbon dioxide

ammonia

[2]

3. (a) A series of experiments was carried out to investigate the effect of different factors on the reaction between calcium carbonate and hydrochloric acid. The diagram shows the apparatus used to collect results.



The time taken to collect 50 cm³ of carbon dioxide gas in each experiment is shown in the table.

Experiment	Temperature of hydrochloric acid (°C)	Concentration of hydrochloric acid (mol/dm ³)	Time taken to collect 50 cm ³ of gas (s)
1	40	1	92
2	40	0.5	185
3	60	1	38

- (i) Give the numbers of the **two** experiments that should be compared to show the effect of changing concentration on the time taken. Describe what these results show. [2]

Experiments and

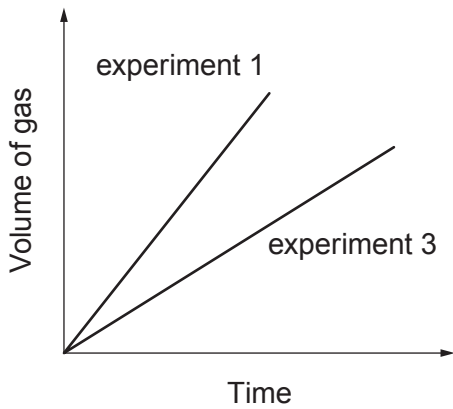
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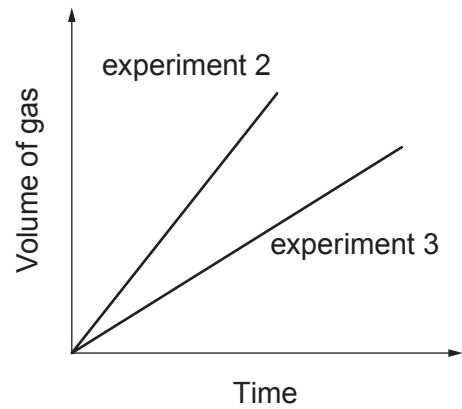
- (ii) Give **two** factors relating to the calcium carbonate that should be kept the same to ensure a fair test. [2]

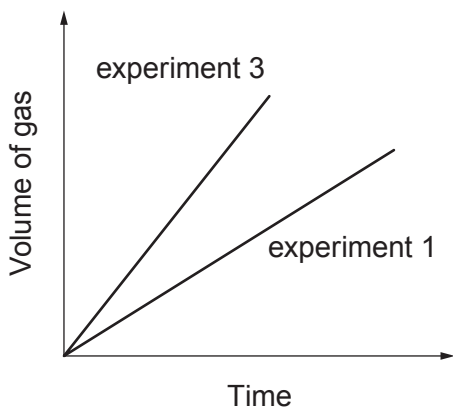
Factor 1

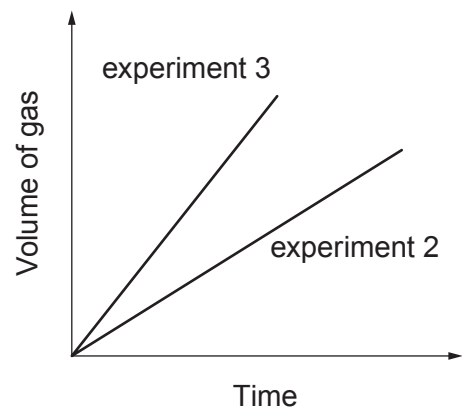
Factor 2

- (iii) Assuming that a fair test was carried out, place a tick (✓) in the box of the graph that shows how temperature affects the volume of gas collected over time for this reaction. [1]

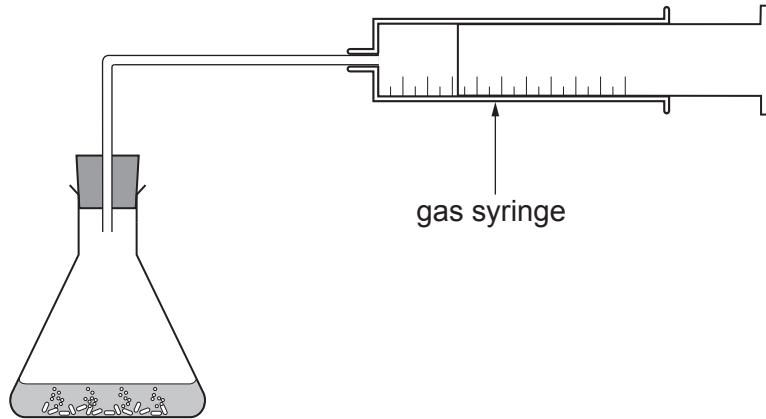








(b) An alternative method for collecting the gas is shown below.



Give **two** reasons why this method could improve the accuracy of the results.

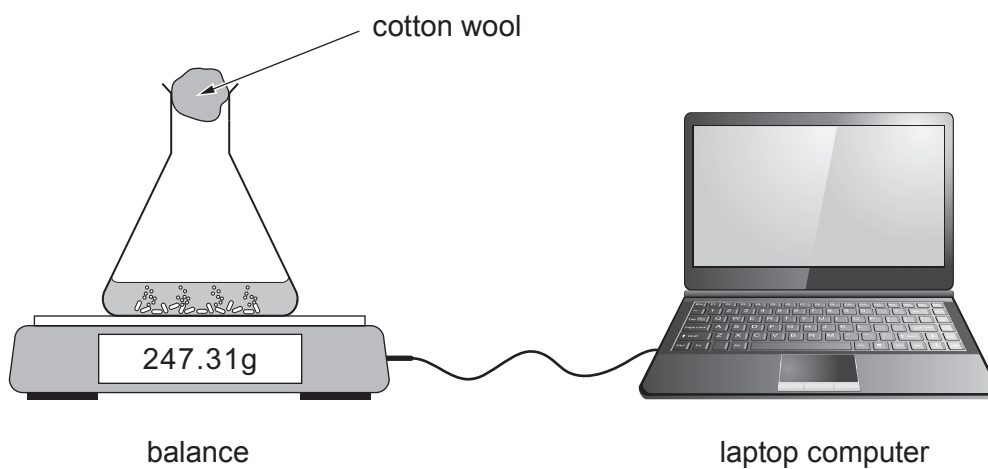
[2]

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- (c) The reaction can also be investigated by recording the change in mass over time.



- (i) State how the mass would change over time. Give a reason for your answer. [2]

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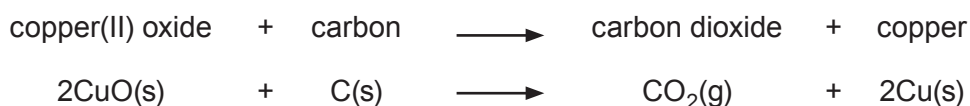
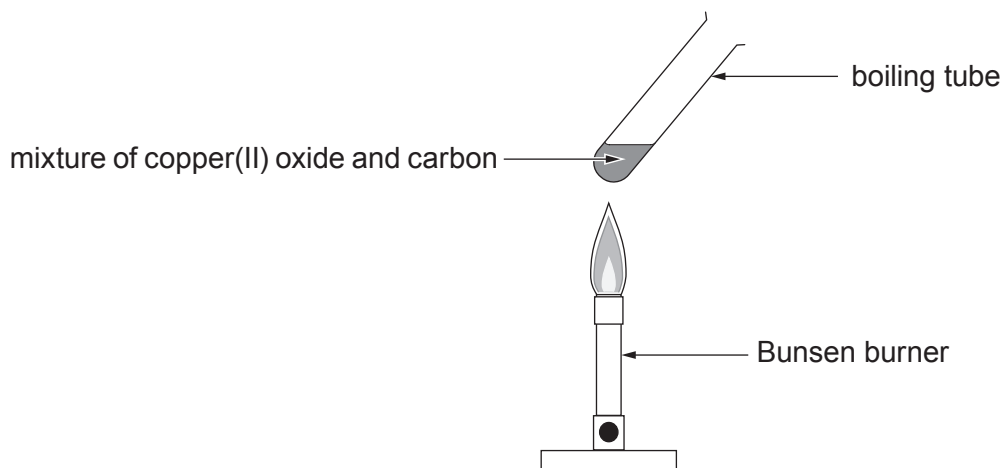
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- (ii) Give **one** benefit of connecting the balance to a laptop computer. [1]

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4. (a) In a class practical, Isobel demonstrated how copper can be extracted from copper(II) oxide using carbon. The apparatus used and equation for the reaction are shown below.



- (i) State which substance is being reduced during Isobel's experiment. How does the equation show this? [2]

.....

.....

.....

- (ii) Isobel was able to predict correctly which pairs of powders would react when heated strongly. Tick (✓) the box next to **each** pair that would react. [2]

copper and magnesium oxide	<input type="checkbox"/>
carbon and aluminium oxide	<input type="checkbox"/>
carbon and iron oxide	<input type="checkbox"/>
gold and copper oxide	<input type="checkbox"/>
magnesium and copper oxide	<input type="checkbox"/>

- (b) Metals are extracted from compounds found in their ores. These compounds are often oxides or sulfides of the metals. The percentage by mass of different metals in their compounds is given in the following table.

Name of ore	Formula of metal compound	Relative formula mass of compound	Percentage by mass of metal in compound (%)
haematite	Fe_2O_3	160	70.0
galena	PbS	239	86.6
sphalerite	ZnS	97	67.0
chalcocite	Cu_2S	?	?

Calculate the percentage by mass of copper in Cu_2S and compare this value to the percentage by mass of the other metals in their compounds. [3]

$$A_r(\text{Cu}) = 63.5 \quad A_r(\text{S}) = 32$$

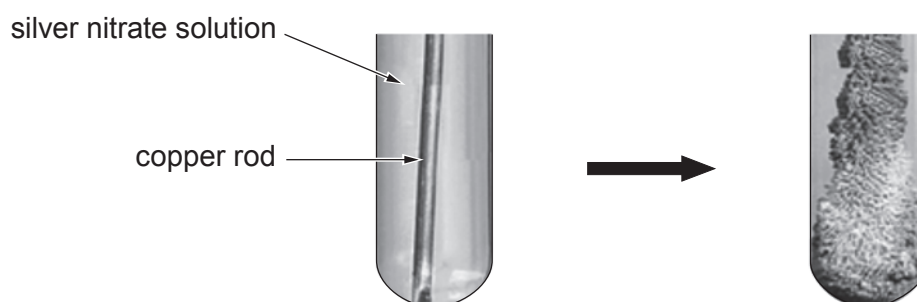
Percentage by mass = %

.....

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5. A student investigated the reaction between copper and silver nitrate solution.



- (a) The student wanted to test the following hypothesis:

“the mass of silver that forms will increase as time increases”

The results below show the mass of silver formed when a 10cm copper rod was placed in 25cm³ of silver nitrate solution for different amounts of time.

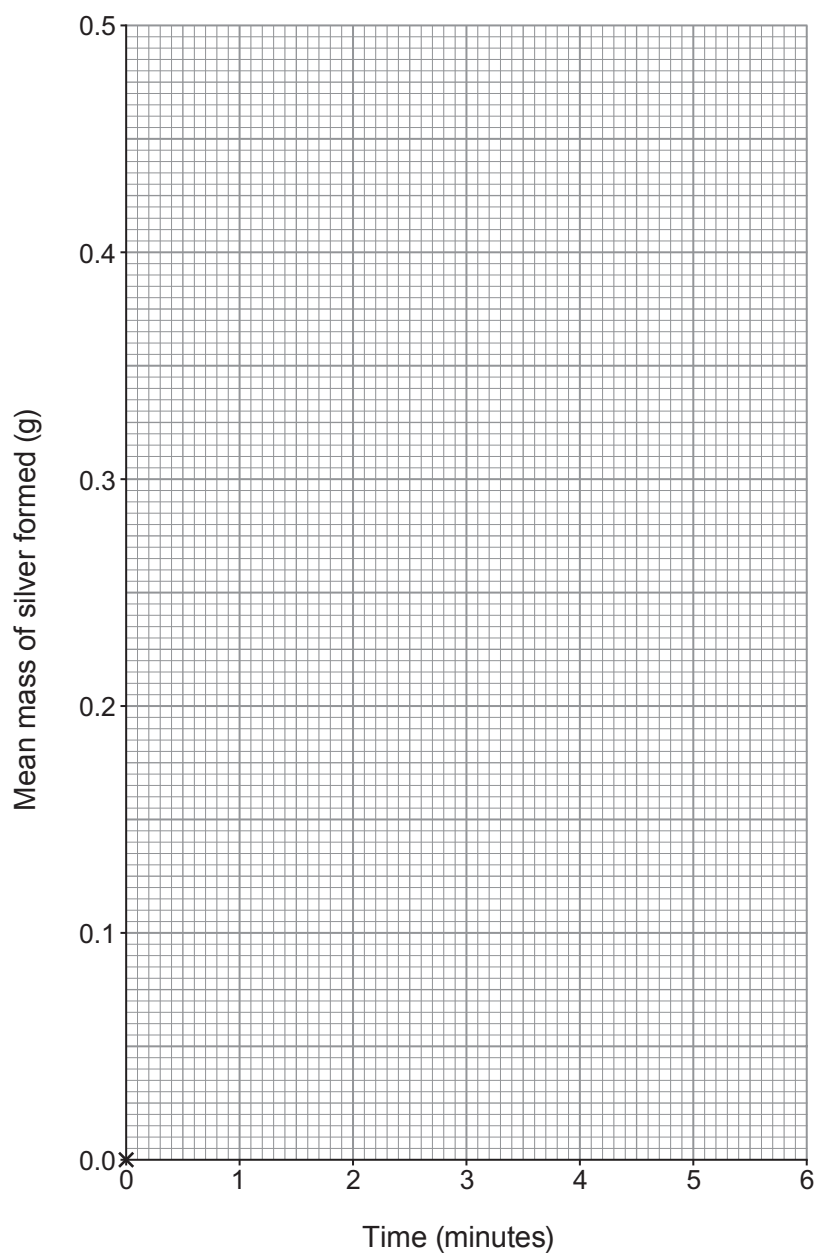
Time (minutes)	Mass of silver formed (g)			
	Result 1	Result 2	Result 3	Mean
1	0.08	0.10	0.06	0.08
2	0.14	0.15	0.16	0.15
3	0.25	0.23	0.27	0.25
4	0.39	0.31	0.33	0.32
5	0.40	0.38	0.33	0.39

- (i) Circle the **two** results that were not used in calculating mean values. [1]
- (ii) State how the results for 2 minutes show the best repeatability. [1]

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.....

- (iii) Plot the mean results from the table on the grid below and draw a suitable line. [3]



- (iv) Use the graph to:

I. Give the mass of silver that would form in 2.5 minutes. [1]

..... g

II. Predict the mass of silver that would form in 6 minutes. [1]

..... g

(b) The silver can be collected from the reaction mixture by carefully washing it from the copper rod. The mixture can then be filtered, washed and dried.

(i) Give **one** reason why this method could lead to the recorded mass being lower than the expected value. [1]

.....

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(ii) Give **one** reason why this method could lead to the recorded mass being higher than the expected value. [1]

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(c) To extend the investigation, the student decided to test another hypothesis:

“as the length of the copper rod increases, the mass of silver deposited also increases”

(i) Complete the table to identify the independent and dependent variable to test this hypothesis. [1]

Variable	Description
independent variable	
dependent variable	

(ii) Give **one** control variable that would enable the students to collect valid data. [1]

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SECTION B

Read the article in the **Resource Booklet** and answer **all** the questions that follow.

7. (a) Refer to **Figure 1**. Identify the functional group common to all alcohols. [1]

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- (b) Propanol is another alcohol. Draw its displayed formula and give its molecular formula. [2]

Displayed formula

Molecular formula

- (c) Use the information to calculate how many million barrels of ethanol were produced in Brazil in 2010. [3]

..... million barrels

- (d) Give the reason why the data collected using the equipment in **Figure 4** gives a smaller energy content value for ethanol than that shown in **Figure 5**. State how the experiment could be improved to give a value closer to the actual value. [2]

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(e) Use **Figure 5** to describe the relationship between the carbon : hydrogen ratio and energy content for the fuels. [3]

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(f) A student looked at **Figure 5** and concluded that “hydrogen is a better fuel than ethanol”.
Discuss this statement using information from the table and your knowledge of fuels.
Give advantages and disadvantages of both fuels. [4]

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END OF PAPER

15

FORMULAE FOR SOME COMMON IONS

POSITIVE IONS		NEGATIVE IONS	
Name	Formula	Name	Formula
aluminium	Al^{3+}	bromide	Br^-
ammonium	NH_4^+	carbonate	CO_3^{2-}
barium	Ba^{2+}	chloride	Cl^-
calcium	Ca^{2+}	fluoride	F^-
copper(II)	Cu^{2+}	hydroxide	OH^-
hydrogen	H^+	iodide	I^-
iron(II)	Fe^{2+}	nitrate	NO_3^-
iron(III)	Fe^{3+}	oxide	O^{2-}
lithium	Li^+	sulfate	SO_4^{2-}
magnesium	Mg^{2+}		
nickel	Ni^{2+}		
potassium	K^+		
silver	Ag^+		
sodium	Na^+		
zinc	Zn^{2+}		

THE PERIODIC TABLE

1 2 3 4 5 6 7 0

Group

7 Li Lithium 3	9 Be Beryllium 4											4 He Helium 2					
23 Na Sodium 11	24 Mg Magnesium 12											19 F Fluorine 9					
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
86 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	99 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	179 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	210 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86
223 Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89															

Key

relative atomic mass

Ar
Symbol
Name
Z

atomic number