Surname	Centre Number	Candidate Number
Other Names		0



New GCSE

4472/01

ADDITIONAL SCIENCE FOUNDATION TIER CHEMISTRY 2

A.M. MONDAY, 21 May 2012

l hour

For Examiner's use only						
Question	Maximum Mark	Mark Awarded				
1	4					
2	9					
3	6					
4	10					
5	7					
6	6					
7	6					
8	6					
9	6					
Total	60					

ADDITIONAL MATERIALS

In addition to this paper you will need a calculator and a ruler.

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.

INFORMATION FOR CANDIDATES

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

You are reminded of the necessity for good English and orderly presentation in your answers.

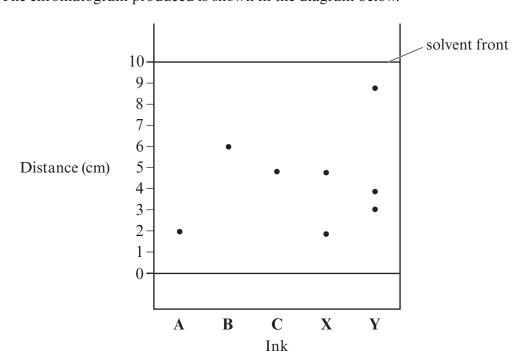
Assessment will take into account the quality of written communication (QWC) used in your answer to question 7.

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

Answer all questions.

1. James and Lucy were investigating colours in ink. They were given three pure substances, A, B and C, and two mixtures X and Y.

They carried out a paper chromatography experiment. The chromatogram produced is shown in the diagram below.



(a) (i) Which substances were found in mixture X? [1]

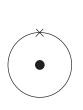
- (ii) What did the experiment tell them about mixture Y? [1]
- (b) The R_f value of a substance can be used to identify that substance. The R_f value is given by the formula

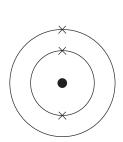
$$R_f = \frac{\text{distance moved by substance}}{\text{distance moved by solvent front}}$$

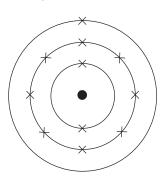
Calculate the \mathbf{R}_f value for \mathbf{B} .	[2]

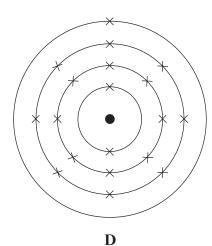
2. (a) The following diagrams represent four atoms, A, B, C and D.

A, B, C, and D are not chemical symbols.









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(i)

B

 \mathbf{C}



- (ii) Give the atomic number of **B**. [1]
- (iii) State which period of the Periodic Table element **D** belongs to. [1]

.....

(iv) Which of the above diagrams represents an atom of potassium? [1]

.....

(v) Name the particle found in the nucleus of **all** atoms. [1]

.....

(b) (i) Calculate the relative molecular mass (M_r) of calcium carbonate, $CaCO_3$.

$$A_{\rm r}({\rm Ca}) = 40$$
 $A_{\rm r}({\rm C}) = 12$ $A_{\rm r}({\rm O}) = 16$

(ii) Calculate the percentage by mass of calcium in calcium carbonate. [2]

.....

[2]

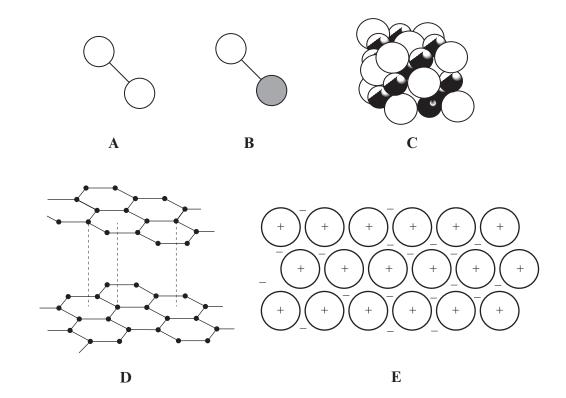
3. (a) The table below shows some properties of five substances.

Substance	Melting point (°C)	Electrical conductivity	Density (g/cm ³)	Structure
carbon dioxide	-78	poor	0.002	simple covalent
copper	1083	good	8.92	metallic
graphite	3730	good	2.25	giant covalent
nitrogen	-210	poor	0.00013	
sodium chloride	801	good when molten or dissolved in water	2.17	giant ionic

	(i)	Name the substance with the lowest melting point in the table.	
			[1]
	(ii)	Complete the table by giving the structure of nitrogen.	[1]
	(iii)	Name a substance from the table which is a non-metallic element.	[1]
(b)	Give	e two reasons why copper is used to make saucepan bases.	[2]
	1.		
	2.		

(c) Give the letter of the diagram below that represents the structure of sodium chloride.

[1]



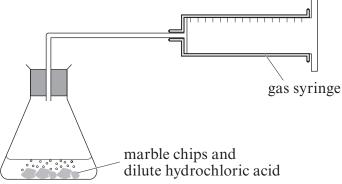
represents the structure of sodium chloride.

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4. Marble chips are made of calcium carbonate and react with dilute hydrochloric acid to give off carbon dioxide.

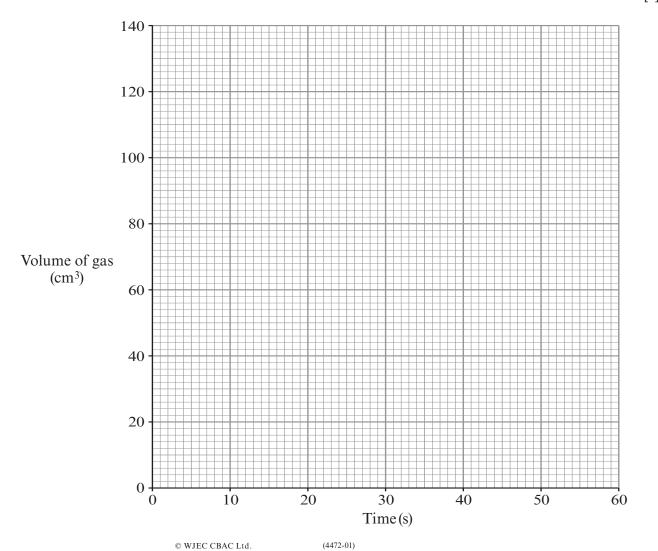
Excess marble chips and 100 cm³ of hydrochloric acid were placed in the flask in the apparatus shown below.



The volume of gas given off was measured every 10 seconds and recorded in the table below.

Time (s)	0	10	20	30	40	50	60
Volume of gas (cm ³)	0	52	80	92	114	120	120

(a) (i) Plot the results from the table on the grid below and draw a smooth curve of best fit.

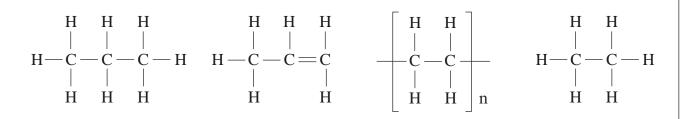


(ii) 	Find the time taken for the reaction to finish and state how you reached your answer. [2]
(iii)	Complete the following statement by placing a tick () in the box next to the correct answer. Using the graph , give the reason for your choice.
	The reaction is proceeding at its fastest rate from [2]
	0-10 s
	10-20 s
	20-30 s
	30-40 s
	40-50 s
	50-60 s
Re	ason
Sta	ate two ways in which this reaction could be made to go faster. [2]
2.	
If t	the acid had been in <i>excess</i> , instead of the marble chips, state one different observation at would have been made at the end of the experiment. [1]
•••••	

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5. The following diagrams show the structural formulae of four organic compounds, A, B, C and D.



A B C D

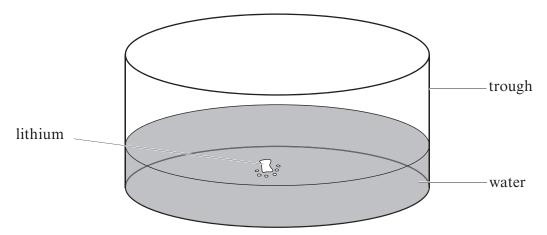
- (a) (i) Give the **molecular** formula of \mathbf{B} . [1]
 - (ii) State which of the above compounds is an alkene. [1]
 - (iii) State which of the above is a polymer. [1]
- (b) Draw the **structural** formula for butane, C_4H_{10} . [1]

(c) You have been given two plastics (polymers) – PVC and melamine. PVC is a thermoplastic and melamine is a thermoset. You are asked to carry out a simple test on both plastics in order to identify them. State what you would do and give the expected result for both.

[3]

6. This question is about the reactions of Group 1 metals.

The following diagram shows how lithium reacts with water.



(a)	Apart from	wearing	goggles,	give o	one safety	precaution	taken	when	carrying	out	this
	experiment.										[1]

(b)	Complete the following word equation for the reaction that takes place.	[2]
<i>(b)</i>	Complete the following word equation for the reaction that takes place.	[

	lithium	+	water —		·	+	
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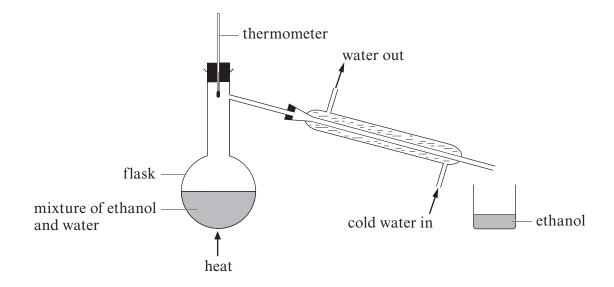
(c)	Name the least reactive metal in Group 1.	[1]

(d)	Describe what differences you would have observed if potassium had been added to	the
	water in the trough instead of lithium.	[2]

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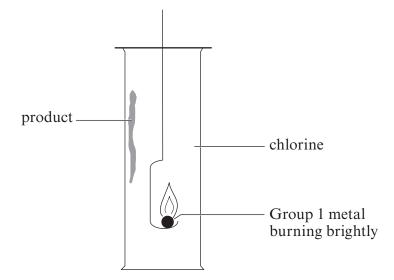
7. A mixture of ethanol and water can be separated by distillation.

A diagram of the apparatus which can be used is shown below.



Describe what happens during the process and explain how this method of separation works. [6 QWC]

Group 1 metals react vigorously when heated and lowered into a gas jar of chlorine, Cl₂, as shown in the diagram below.



(a) When a flame test was carried out on the product of such a reaction a yellow flame was seen. Identify the Group 1 metal that was used.

(b) Give the balanced **symbol** equation for the reaction.

[3]

Describe how you would test for chloride ions in a solution of the product, giving the (c) expected observation.

9. The following table contains information about the numbers of particles contained within atoms and ions A-F.

A, B, C, D, E and F are not chemical symbols.

	A	В	C	D	E	F
Number of electrons	8	10	9	10	10	11
Number of neutrons	10	10	10	10	12	12
Number of protons	8	8	9	10	10	11

(a)	State the group and period of the Periodic Table to which A belongs.	[1]
	Group Period	
(b)	(i) Choose the letter A-F which represents an ion.	[1]
	(ii) Give the charge of this ion.	[1]
(c)	Give the letter A-F which represents an atom/ion with a mass number of 20.	[1]
(d)	Choose the letters A-F which represent isotopes and give the reason for your choice.	[2]

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FORMULAE FOR SOME COMMON IONS

POSITIV	VE IONS	NEGATI	VE IONS
Name	Formula	Name	Formula
Aluminium	Al ³⁺	Bromide	Br ⁻
Ammonium	NH_4^+	Carbonate	CO_3^{2-}
Barium	Ba^{2+}	Chloride	\mathbf{Cl}^-
Calcium	Ca ²⁺	Fluoride	\mathbf{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-} SO_4^{2-}
Lithium	Li^+	Sulfate	$\mathrm{SO_4}^{2-}$
Magnesium	Mg^{2+} Ni^{2+}		
Nickel	Ni ²⁺		
Potassium	\mathbf{K}^{+}		
Silver	$\mathbf{Ag}^{\mathbf{+}}$		
Sodium	Na ⁺		
Zinc	Zn^{2+}		

PERIODIC TABLE OF ELEMENTS

2 9 2	⁴ He	Helium	14N 16O 19F 20Ne) 0	n Oxygen Fluorine	Oxygen Fluorine 32 S 17 C1	Oxygen Fluorine $\frac{32}{16}$ S $\frac{35}{17}$ Cl Sulfur Chlorine	Oxygen Fluorine 32 S	Oxygen Fluorine 32 S	Oxygen Fluorine 32 S 17 Chlorine Sulfur Chlorine 79 Se 80 Br Selenium Bromine 128 Te 127 I	Oxygen Fluorine 32 S 35 C1 34 Se 35 Br 34 Se 36 Br Selenium Bromine 128 Te 127 I Tellurium Iodine	Oxygen Fluorine 32 Sulfur Chlorine Sulfur Chlorine 79 Se 80 Br Selenium Bromine 128 Te 127 I 79 Se 127 I 128 Te 127 I Tellurium Iodine 200 Po 85 At	Oxygen Fluorine 32 Sulfur Chlorine Sulfur Chlorine 34 Se 35 Cl Selenium Bromine 128 Te 127 I 52 Te 53 Te Tellurium Iodine 210 Po 210 At Polonium Astatine	0xygen Fluorine 32 Sulfur Chlorine Sulfur Chlorine 34 Se \$80 Br Selenium Bromine 128 Te 127 I 52 Te 53 At Tellurium Iodine 210 Po 85 At Polonium Astatine
4			12 C	,	Carbon	Carbon 28 Si	Carbon 28 Si 14 Silicon	Carbon 28 Si 14 Si Silicon 73 Ge	Carbon 28 Si 14 Si Silicon 73 Ge Germanium	Carbon 28 Si 14 Si Silicon 73 Germanium Germanium	Carbon Silicon Germanium Germanium Tin	Carbon Silicon Silicon Germanium Germanium Tin Tin Tin	Carbon Silicon Germanium Germanium Tin Tin Lead	Carbon 28 Si 14 Si Silicon Germanium 119 Sn Tin Tin Lead
3			$^{11}_{5}\mathbf{B}$	Boron		²⁷ A1	27 A1 Aluminium			' 				
								08 Zn						
								64 Cu	<u> </u>					
			ı					% N 8% Ni	28 Ni Nickel					
	H_1^1	Hydrogen						⁵⁹ Co	59 Co 27 Cobalt	59 Co 27 Cobalt Cobalt 103 Rh				
Group								26 Fe						
Ğ								55 Mn	55 Mn 25 Mn Manganese	55 Mn 25 Mn Manganese 99 TC			<u> </u>	
								⁵² Cr	S2 Cr 24 Cr Chromium	52 Cr 24 Cr Chromium 96 Mo	52 Cr Chromium 96 Mo	52 Cr Chromium 96 Mo 42 Mo Molybdenum		
								51 V	S1 V 23 Vanadium	51 V 23 V Vanadium 93 Nb	S1 V 23 Vanadium 93 Nb 41 Niobium	51 V 23 V 41 Niobium Niobium 181 Ta	S1 V Vanadium 93 Nb 41 Niobium Niobium 73 Ta	S1 V 23 V Vanadium 93 Nb 41 Niobium Niobium 73 Ta
								48 Ti	48 Ti 22 Ti	48 Ti 22 Ti Titanium 91 Zr				
								45 Sc 21 Sc	45 Sc 21 Scandium	45 Sc 21 Scandium Scandium 89 Y	45 Sc 21 Scandium Scandium 89 Y 39 Y	45 Sc 21 Scandium Scandium 89 Y 39 Y Ttrium 77ttrium 57 La	45 Sc 21 Scandium Scandium 89 Y 39 Y Tttrium 77 La 57 La	45 Sc 21 Scandium Scandium 89 Y Yttrium 139 La 57 La 89 Ac
					г	-po	Ag sium	Mg esium	24 Mg Magnesium Magnesium 20 Ca	Mg nesium Ca Cium Sr	Magnesium Magnesium Calcium 88 Sr Strontium	24 Mg 12 Magnesium 40 Ca 20 Calcium 88 Sr 38 Sr Strontium 137 Ba		
2			⁹ ₄ Be	Lithium Beryllium	1 1 2	$ $ $^{24}_{12}$ Mg	Sodium Magne							