Surname	Centre Number	Candidate Number
Other Names		0



New GCSE

4462/02

SCIENCE A HIGHER TIER CHEMISTRY 1

A.M. TUESDAY, 12 June 2012

1 hour

Suitable for Modified Language Candidates

For Examiner's use only					
Question	Maximum Mark	Mark Awarded			
1.	5				
2.	5				
3.	8				
4.	6				
5.	6				
6.	8				
7.	5				
8.	4				
9.	4				
10.	3				
11.	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

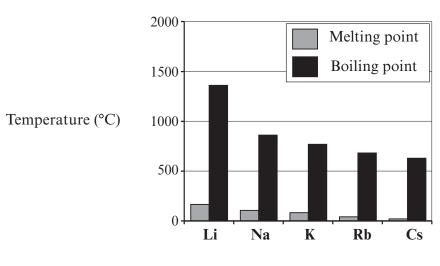
The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication used in your answer to questions 4 and 11.

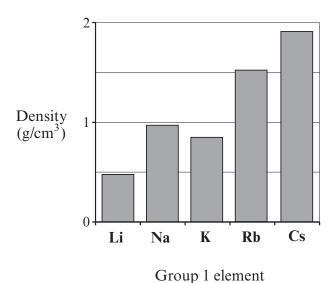
The Periodic Table is printed on the back cover of the examination paper and the formulae for some common ions on the inside of the back cover.

Answer all questions.

1. The graphs below show the trends in melting points, boiling points and densities of Group 1 elements.



Group 1 element



Use the information in the graphs. Answer the following questions.

(a) Describe the trends in the melting points and densities of the elements going **down** the group. [2]

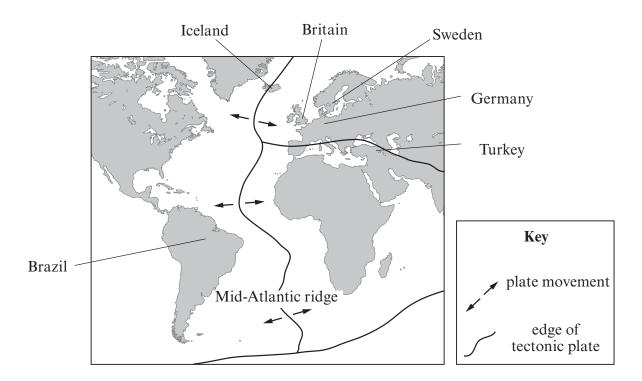
(b) Give the name of the element which has a property which does not fit a trend. [1]

(c) The table below shows the boiling points of Group 1 elements.

Group 1 element	Boiling point (°C)
lithium	1340
sodium	880
potassium	780
rubidium	690
caesium	670

Francium lies below caesium in Group 1. Estimate a value for the boiling point of francium. Give your reasoning.	[2]
<i>Value</i> °C	
Reason for value	

4462 020003 2. The map below shows some information about tectonic plates.



(a) Look at the countries labelled on the map above. Which country would you expect to have the **most** volcanic eruptions? Give a reason for your choice of country. [2]

(b) Wegener's theory of continental drift was not accepted by other scientists until several years after his death in 1930. In 1960 parts of the ocean floor were surveyed, at various distances from a plate boundary. The data below shows the age of the rocks.

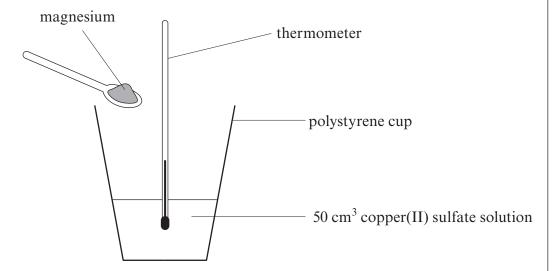
Distance from the plate boundary (km)	500	1000	1500	2000	2500
Age of rock (millions of years)	24	46	71	90	113

(i)	Describe the pattern in the results.	[1]

(ii)	Use the data. What conclusions can be drawn about what is happening	at the plate
	boundary?	[2]

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3. Increasing amounts of powdered magnesium were added to 50 cm³ of copper(II) sulfate solution in a polystyrene cup. This is shown in the diagram below. Four pupils investigated the temperature change which occurred.



- In the first experiment, each pupil weighed 0.2 g of magnesium.
- The pupils then measured out 50 cm³ of copper(II) sulfate solution into a polystyrene cup. They recorded the temperature of the solution.
- The pupils then added the magnesium to the solution. They swirled the polystyrene cup and recorded the maximum temperature rise.
- They repeated the experiment using 0.4, 0.6, 0.8 and 1.0 g of magnesium powder. They used a new 50 cm³ of copper(II) sulfate solution each time.

The table below shows the results recorded.

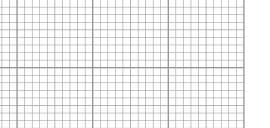
Mass of magnesium		Maximuı	m temperature	e rise (°C)	
powdered (g)	Pupil A	Pupil B	Pupil C	Pupil D	Mean
0.2	3.5	3.5	3.7	3.7	3.6
0.4	6.0	5.9	6.1	6.0	6.0
0.6	7.8	8.2	8.0	8.0	8.0
0.8	9.1	9.0	3.0	8.9	9.0
1.0	8.8	9.2	8.9	9.1	9.0

(a) (i) Circle the odd result **not** used in calculating one of the mean temperature rises.[1]

(ii) Suggest **one** possible cause for this odd result.

[1]

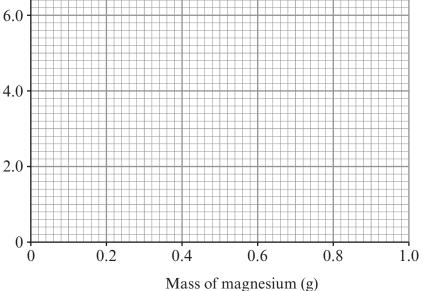
(b) Use the grid provided. Plot the mean temperature rise against the mass of magnesium added. Draw a line of best fit starting at the origin (0,0). [3]



Temperature rise (°C)

10.0

8.0



(c) Why must the line of best fit be drawn to the origin (0,0)?

[1]

(d) Use your graph. Find the smallest mass of magnesium needed to react with **all** the copper(II) sulfate. Give the reason for your answer. [2]

8

Turn over.

4.	Most scientists believe that the increase in the level of carbon dioxide in the atmosphere during the last 150 years has resulted in global warming.
	Briefly describe and explain your understanding of the term 'global warming'. [6 QWC]
	In your answer you should refer to
	 its cause(s) its consequence(s) what can be done to reduce its impact

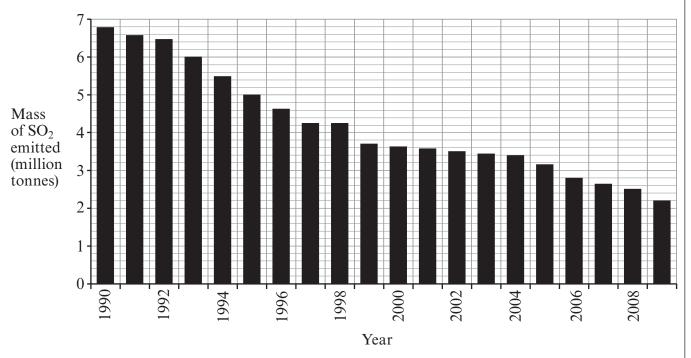
	600
462	200
4	0

							_						A	В		
C												D				
E										F						
(ii) (iii)	Th	ate tw	le bel	ow sł	nows											
	Th	ne tabl	le bel	ow sl	nows		e proj		es of o	one o		six el		ts id	entifi	ed
	Th	ne tabl	le bel	ow sle abo	nows		e proj	pertie	es of o	one o		six el	emen	ts ide	entifi	ed PC
	Th	me tabl riodic Melti	le bele Tabl	ow she abo	nows ove.	some	Boi	pertie	ooint	one o	f the	six el App	emen beara iny b	ts ide	entifi at 20°	ed PC

[1]

How did Mendeleev overcome the problem of undiscovered elements?

6. (a) The bar chart below shows the mass of sulfur dioxide emitted each year in the UK between 1990 and 2009.



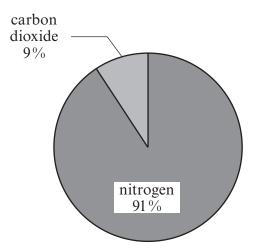
(i) Describe the trend in sulfur dioxide emissions between 1990 and 2009. [1]

(ii) Calculate the % decrease in sulfur dioxide emissions between 2008 and 2009. Show your workings. [3]

(b) (i) One significant source of acid rain is coal-burning power stations. Explain how burning coal results in the formation of acid rain. [3]

(ii) State **one** method of reducing sulfur dioxide emissions from coal-burning power stations. [1]

7. (a) The pie charts below show the composition of the Earth's atmosphere at 3000 million and 2000 million years ago.



carbon dioxide 8% nitrogen 82%

Composition of the Earth's atmosphere 3000 million years ago

Composition of the Earth's atmosphere 2000 million years ago

		ercentages of carbon di lion years ago. State and			
•••••					
•••••					
(b)	State the perce today.	entages of nitrogen, oxyg	en and carbon dio	xide present in tl	ne atmosphere
	nitrogen		%		
	oxygen		%		
	carbon dioxide		0/0		

5

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8. (a) Aqueous solutions of sodium carbonate, sodium chloride and sodium hydroxide are stored in three bottles labelled **A**, **B** and **C**. They are not necessarily in that order.

A class of pupils was instructed to carry out the following procedures on each solution.

Procedure 1: Add three drops of universal indicator solution. Record the colour and pH.

Procedure 2: Add dilute hydrochloric acid. Record observations including any temperature change.

The results of one pupil are shown below.

Sodium solution	Procedure 1	Procedure 2			
A	navy blue / pH 10	bubbles formed, temperature increase of 9°C			
В	purple / pH 14	no bubbles formed, temperature increase of 6°C			
С	green / pH 7	no bubbles formed, no temperature change			

(i)	Use the information above to identify solutions A, B and C.	[2]
	A is	
	B is	
	Cis	

(ii) Fill in the boxes to balance the symbol equation below. [1]

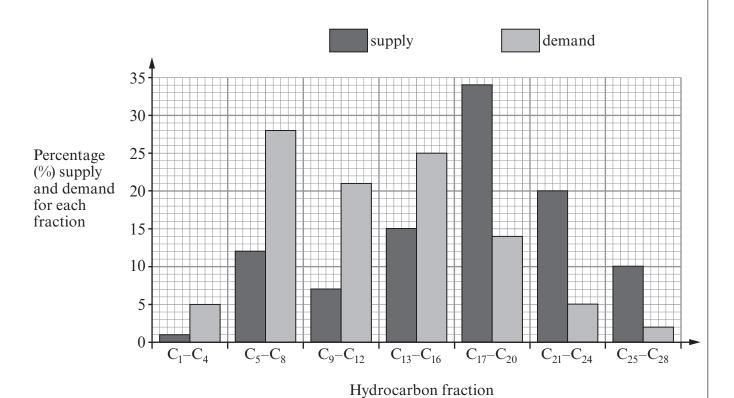
$$Na_2CO_3$$
 + MCl + H_2O + CO_2

(b) Use the table of formulae of common ions on the inside of the back cover of this examination paper. Write the formula of copper(II) nitrate. [1]

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9. Crude oil is a mixture of hydrocarbon compounds. Crude oil can be separated into simpler mixtures called fractions. Each fraction contains hydrocarbons of similar chain lengths.

The bar chart below shows the relative 'supply' and 'demand' for some fractions.



Use the bar chart to help you answer parts (a) and (b).

(a)	Describe how the difference between <i>supply</i> and <i>demand</i> for each fraction change chain length increases.	s as [2]
(b)	Oil companies have developed a process called cracking. State the meaning of the term <i>cracking</i> . Give the reason why it is an important proc	ess. [2]
•••••		•••••

4

10. During the electrolysis of molten aluminium oxide, aluminium ions travel to the cathode and oxide ions travel to the anode.

(a)	The melting point of aluminium oxide is 2000 °C. Cryolite is added to lower this v	'alue
	to 950 °C. Why does reducing the melting point of the electrolyte reduce the cost of	f the
	process?	[1]

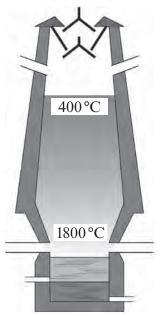
<i>(b)</i>	Why do the ions move to the electrodes during electrolysis?	[1]

(c)	Fill in the boxes to balance the anode equation.	[1]
(0)	I in the boxes to buildined the anode equation.	[+]

$$O^{2-}$$
 $e^ O_2$

3

11. The diagram below shows the blast furnace used to extract iron from its ore.



Outline the industrial extraction of iron from its ore.

[6 QWC]

In your answer you should refer to the

- raw materials
- main reactions taking place

 products form 	ied
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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	Cl ⁻		
Calcium	Ca ²⁺	Fluoride	${f F}$ $^-$		
Copper(II)	Cu ²⁺	Hydroxide	OH^-		
Hydrogen	H^{+}	Iodide	Ι -		
Iron(II)	Fe^{2+}	Nitrate	NO_3^-		
Iron(III)	Fe ³⁺	Oxide	O^{2-}		
Lithium	Li^{+}	Sulfate	$\mathrm{SO_4}^{2-}$		
Magnesium	Mg^{2+} Ni^{2+}				
Nickel	Ni^{2+}				
Potassium	K ⁺				
Silver	$\mathbf{Ag}^{\boldsymbol{+}}$				
Sodium	Na^{+}				
Zinc	$\mathbb{Z}n^{2+}$				

PERIODIC TABLE OF ELEMENTS

		д	45					ä	40	٦	٦					
0	⁴ He	Helium	$_{10}^{20} m Ne$	Neon	$^{40}_{18}{ m Ar}$	Argon	$^{84}_{36}\mathrm{Kr}$	Krypton	131 Xe	Xenon	²²² ₈₆ Rn	Radon				
 			16 F	Fluorine	35 CI	Chlorine	$^{80}_{35} mBr$	Bromine	127 I 53	Iodine	$^{210}_{85}\mathrm{At}$	Astatine				
9			O_{8}^{8}	Oxygen	$\frac{32}{16}$ S	Sulfur	79 Se	Selenium	128 Te	Tellurium	$^{210}_{84}\mathrm{Po}$	Polonium				
w			$^{14}_{7} m N$	Nitrogen	$\mathbf{d}_{12}^{31}\mathbf{p}$	Phosphorus	$^{75}_{33}\mathrm{As}$	Arsenic	122 Sb	Antimony	$^{209}_{83}\mathrm{Bi}$	Bismuth				
4			$^{12}_{6}$ C	Carbon	28 Si	Silicon	73 Ge	Germanium	$^{119}_{50}\mathrm{Sn}$	Tin	$^{207}_{82}$ Pb	Lead				
m			11 B	Boron	$^{27}_{13}$ Al	Aluminium	⁷⁰ Ga	Gallium	115 In	Indium	$^{204}_{81} \mathrm{Tl}$	Thallium			loc	
							$_{30}^{65}\mathrm{Zn}$	Zinc	112 48 Cd	Cadmium	$^{201}_{80}\mathrm{Hg}$	Mercury			Element Symbol	•
							64 29 Cu	Copper	$^{108}_{47}\mathrm{Ag}$	Silver	¹⁹⁷ Au	Gold			– Eleme	
							$^{59}_{28}\mathrm{Ni}$	Nickel	106 Pd	Palladium	195 Pt	Platinum			×	
	$\mathbf{H}_{\mathbf{I}}^{\mathbf{I}}$	Hydrogen					⁵⁹ Co	Cobalt	103 Rh	Rhodium	¹⁹² ₇₇ Ir	Iridium			₹	Z
Group							56 Fe	Iron	101 44 Ru	Ruthenium	190 Os	Osmium			۲. ا	lber —
Gre							55 Mn	Manganese	99 Tc	Technetium	¹⁸⁶ Re	Rhenium			Mass number	Atomic number
							⁵² ₂₄ Cr	Chromium	⁹⁶ Mo	Molybdenum	184 W	Tungsten		Key:	Mas	Ator
							51 V 23 V	Vanadium	93 Nb	Niobium	¹⁸¹ Ta	Tantalum				
							48 Ti	Titanium	$^{91}_{40}\mathrm{Zr}$	Zirconium	179 Hf	Hafnium				
							45 Sc 21 Sc	Scandium	$^{89}_{39}\mathrm{Y}$	Yttrium	¹³⁹ La	Lanthanum	$^{227}_{89}\mathrm{Ac}$	Actinium		
7			⁹ ₄ Be	Beryllium	$_{12}^{24}\mathrm{Mg}$	Magnesium	⁴⁰ ₂₀ Ca	Calcium	88 38 Sr	Strontium	137 Ba	Barium	$^{226}_{88}\mathbf{Ra}$	Radium		
_			$_{3}^{7}$ Li	Lithium	²³ Na	Sodium	$^{39}_{19}\mathrm{K}$	Potassium	86 Rb	Rubidium	133 Cs	Caesium	$^{223}_{87}\mathrm{Fr}$	Francium		