Surname	Centre Number	Candidate Number
Other Names		0



GCSE

240/01

ADDITIONAL SCIENCE FOUNDATION TIER CHEMISTRY 2

A.M. WEDNESDAY, 25 May 2011

45 minutes

For Examiner's use only			
Question	Maximum Mark	Mark Awarded	
1.	5		
2.	6		
3.	9		
4.	6		
5.	6		
6.	3		
7.	5		
8.	5		
9.	5		
Total	50		

ADDITIONAL MATERIALS

In addition to this paper you may require 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.

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.** (a) Atoms are made up of particles called **electrons**, **neutrons** and **protons**.
 - (i) Complete the table below by writing the name of each particle alongside its correct mass and charge. [2]

Particle	Mass	Charge
	1	+1
	1	0
	very small	-1

(ii) Name the particles found in the shells (orbits) of atoms.

[1]

(iii) Name one particle found in the nucleus of an atom.

[1]

(b) Put a tick (\mathcal{J}) in the box next to the calculation used to find the relative molecular mass (M_r) of sulphuric acid, H_2SO_4 . [1]

$$A_{\rm r}({\rm H}) = 1$$
 $A_{\rm r}({\rm O}) = 16$ $A_{\rm r}({\rm S}) = 32$

$$1 + 32 + 16$$

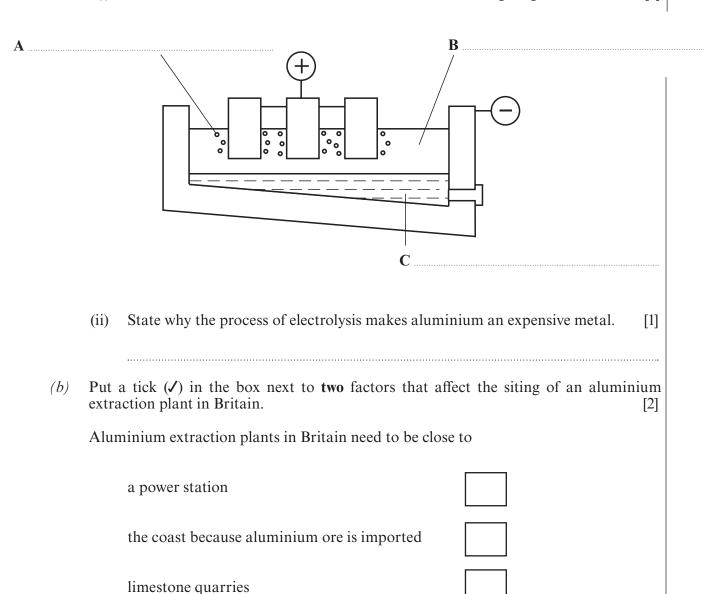
2. (a) Read the information about the extraction of aluminium given in the box below.

The main ore of aluminium is bauxite. Bauxite is mainly aluminium oxide and the impurity iron oxide. Aluminium is extracted from molten aluminium oxide by the process of electrolysis. During the process, aluminium oxide is broken down into aluminium and oxygen using an electric current. Aluminium is formed at the negative cathode and oxygen at the positive anode. The process is expensive because a lot of electrical energy is needed.

Use only the information in the box to answer parts (i) and (ii).

(i) Name the substances labelled A, B and C in the following diagram.

[3]



Turn over.

6

coal mines

bauxite mines

3. (a) The table below shows the ions present in four different bottled mineral waters, A-D.

Long procent	Typical analysis / mg dm ⁻³				
Ions present	A	В	C	D	
calcium	12	40.5	22.0	181	
magnesium	1.6	11.6	11.5	53.5	
potassium	0.7	0.9	1.0	2.5	
sodium	3.9	9.4	22.0	36.1	
hydrogencarbonate	45.0	190.0	116.0	239.0	
chloride	5.0	8.1	14.0	57.5	
sulphate	4.0	6.4	4.0	459.0	
nitrate	1.0	2.4	0.1	2.2	

Use the data in the table to answer parts (i) and (ii).

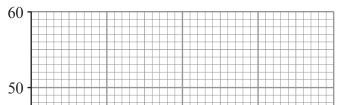
(i)	State which water is the hardest .	[1]
(ii)	Give two reasons for your choice in (i).	[2]
	1.	
	2	

(b) 1 cm³ of soap solution was shaken the same number of times, with equal volumes of each of the waters. The froth height was measured in each experiment. Results are shown in the table below.

Mineral water	Froth height / mm
A	59
В	35
С	38
D	2

(i) Complete the bar chart of the results on the grid below.

[2]



Froth height / mm

(ii) Use the bar chart to place the mineral waters, **A-D**, in order of hardness.

hardest

.....

.....

softest

(iii) Give two ways in which this experiment was made a fair test.

[2]

[1]

[1]

1.

2.

(iv) State which part of the procedure could make the results unreliable.

[1]

[1]

Polythene is made from ethene and is an example of a polymer. 4. *(a)*

alkanes	alkenes	cracking	monomers	polymerisation	polymers
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Choose words from the above box to complete the following sentences.

(i)	Small molecules, like ethene, which can join together are called		
		[1]	

(ii)	Ethene belongs to the family of hydrocarbons called

(iii)	The process of making polythene from ethene is called	
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(b) The table below shows some properties of four plastics, A, B, C and D.

Plastic	Effect of heat	Flexibility	Hardness	Lets light through?
A	melts	brittle	soft	no
В	melts	flexible	soft	no
C	melts	brittle	hard	yes
D	stable to heat	brittle	hard	no

Use only the information in the table to answer parts (i)-(iii) opposite.

State which plastic, A, B, C or D, you would choose to make the following items, and give the main reason for your choice.

Crash helmet visor < (i)



Plastic	
1 iusiic	

Main reason

(ii) Electric kettle



Plastic

Main reason

(iii) Carrier bag



Plastic

5.	(a)	Use t	he word equation for the formation of ammonia to answer parts (i) and (ii).
			nitrogen + hydrogen ← ammonia
		(i)	Name the reactant which is found in the atmosphere. [1]
		(ii)	Name the product of the reaction. [1]
		(iii)	The above reaction can go in both directions. Give the chemical term used to describe this type of reaction.
	(b)		nonium sulphate, $(NH_4)_2SO_4$, and ammonium nitrate, NH_4NO_3 , are examples ogenous fertilisers made from ammonia.
		(i)	Name the element present in both fertilisers which is used by plants to help then grow.
		(ii)	Name the acid used to make ammonium sulphate, $(NH_4)_2SO_4$. [1]
	(c)	State	how nitrogenous fertilisers might get into our public water supplies. [1]

6.	Smart materials	are	modern	materials	whose	properties	change	with	a	change	in	their
	surroundings.											

(a)	Shape memory polymers are being developed to manufacture self-repairing car bodies.
	The diagram below shows a piece of twisted shape memory polymer.

State how the polymer can be made to regain its original shape.









twisted shape memory polymer

original shape

(b) Thermochromic and photochromic pigments are examples of smart materials that have different colours under different conditions.

State the **type** of smart material used to make the following products, and the change in surroundings which causes the colour change in each case.

(i) Self-darkening sun glasses



Type of smart material

Change in surroundings which causes the colour change

[1]

(ii) Electric kettles



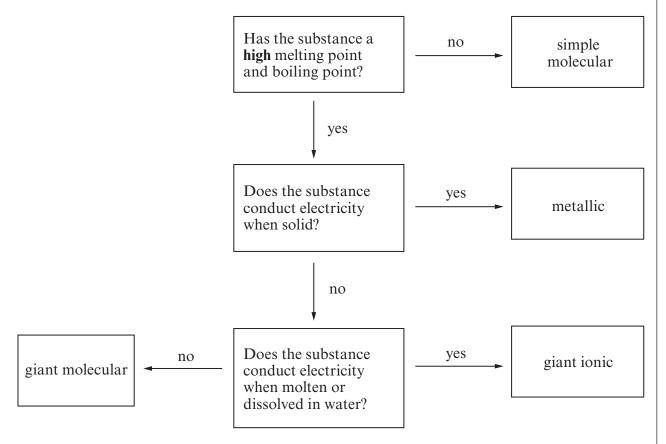
Type of smart material

Change in surroundings which causes the colour change

[1]

.....

7. (a) The flow chart below can be used to identify the type of structure found in different substances.

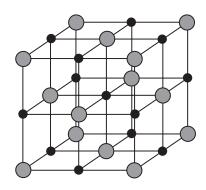


Complete the table below using the flow chart.

[4]

Substance	Melting point /°C	Boiling point /°C	Electrical conductivity	Structure
aluminium oxide	2072	2980	conducts electricity only when molten	
ammonia	-77	-34	does not conduct electricity	
silicon dioxide	1610	2230	does not conduct electricity	
titanium	1667	3277	conducts electricity when solid	

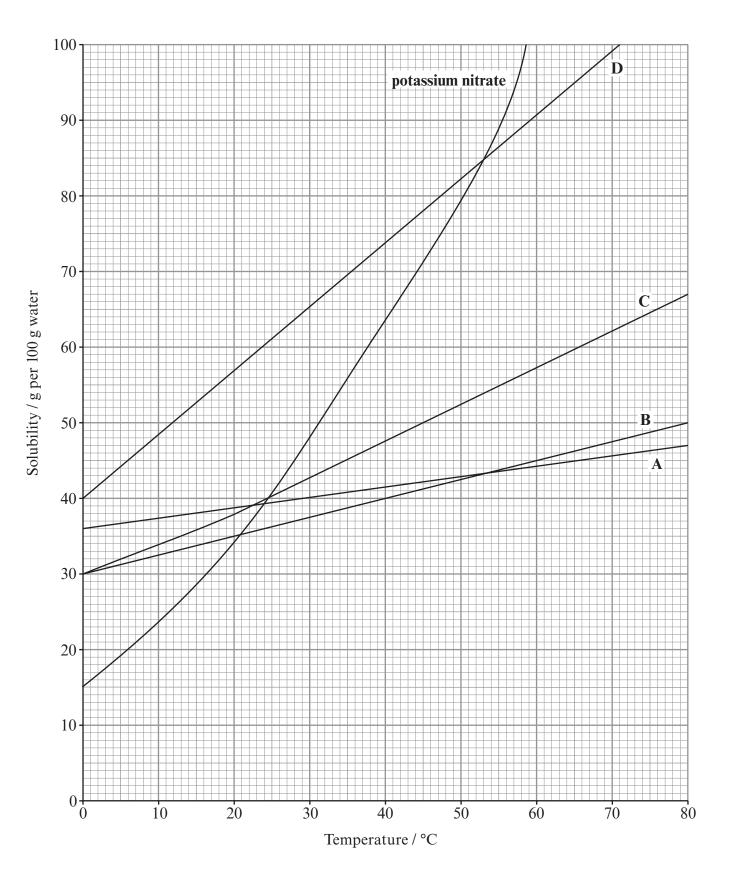
(b) The diagram below shows the structure of sodium chloride.



Describe the electrical conductivity of sodium chloride.							

(0240-01)

8. The graph below shows the solubility of potassium nitrate and four substances, A, B, C and D, in water at various temperatures.



Use the graph to answer parts (a)-(e).

Give	e the letter of the substance which	
(a)	has the lowest solubility at 70 °C,	[1]
(b)	has the same solubility as potassium nitrate at 53 °C,	[1]
(c)	has the solubility that changes the least with temperature,	[1]
(d)	forms 21 g of solid when a saturated solution in 100 g of water at 65 °C is cooled to 40 °C.	°C, [1]
(e)	forms the smallest mass of solid when a saturated solution in 100 g of water at 20 °C cooled to 0 °C.	C is [1]

[1]

9. The table below shows information about the atoms of four elements.

Use the data and key on the Periodic Table of Elements shown on the **back page of this examination paper** to complete the table. [5]

Element	Symbol and data	Number of protons	Number of neutrons	Number of electrons
lithium	⁷ Li	3	4	3
beryllium	⁹ / ₄ Be			4
aluminium		13	14	
	31 P	15	16	15

5

FORMULAE FOR SOME COMMON IONS

POSITIV	VE IONS	NEGATI	EGATIVE IONS		
Name	Formula	Name	Formula		
Aluminium	Al ³⁺	Bromide	Br ⁻		
Ammonium	$\mathrm{NH_4}^+$	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)	$\mathrm{Fe^{3+}}$	Oxide	\mathbf{O}^{2-}		
Lithium	Li^{+}	Sulphate	$\mathrm{SO_4}^{2-}$		
Magnesium	Mg^{2+} Ni^{2+}		•		
Nickel	Ni ²⁺				
Potassium	K ⁺				
Silver	$\mathbf{Ag}^{\boldsymbol{+}}$				
Sodium	Na ⁺				

(0240-01) **Turn over.**

PERIODIC TABLE OF ELEMENTS

Group 1]	on	L)	on	Şe Çe	ton	7	on	ı	nc	Įe.	mn	ြစ	
Group 3 4 5 6 ½Cr ½M <					Radon	222 Rn 86 Rn	Xenon	131 Xe	Krypton	84 Kr 36 Kr	Argon	$^{40}_{18}\mathrm{Ar}$	Neon	$^{20}_{10}\mathrm{Ne}$	Helium	⁴ He	0
Hydrogen Hydrogen						$^{210}_{85}{ m At}$	Iodine	127 I 53	Bromine	80 Br		35 CI		19 F			r
Group 3 4 1 Hydrogen 2 Hydrogen					Polonium	²¹⁰ ₈₄ Po	Tellurium	¹²⁸ ₅₂ Te	Selenium	⁷⁹ Se	Sulphur	$^{32}_{16}$ S	Oxygen	O 8 0			9
Hydrogen Hydrogen					Bismuth	$^{209}_{83}\mathrm{Bi}$	Antimony	122 Sb	Arsenic	75 As	Phosphorus	$^{31}_{15}$ P	Nitrogen	\mathbf{N}_{r}^{4l}			N
52/2 Cr 55/3 Mn 56/3 Fe 59/2 Co 59/3 Ni 64/3 Cu 65/3 Cn 24/2 Mo 99/3 Tc 101/4 Ru 103/3 Rh 105/4 Cd 100/4 Ag 100/4 Ag 100/4 Ag 96/4 Molybdenum Technetium Ruthenium Rhodium Palladium Silver Cadmium 184/4 W 186/4 Molybdenum Ruthenium Rhodium Palladium Silver Cadmium 184/4 W 186/6 Molybdenum Rhenium Osmium Iridium Platinum Gold Mercury Key:					Lead	$^{207}_{82}$ Pb	Tin	$^{119}_{50}\mathrm{Sn}$	Germanium	73 Ge	Silicon	28 Si	Carbon	12 C			4
Group \$\frac{52}{24}\$Cr \$\frac{55}{25}\$Mn \$\frac{56}{26}\$Fe \$\frac{59}{29}\$Co \$\frac{59}{28}\$Ni \$\frac{55}{29}\$Mi \$\frac{56}{29}\$Ni \$\frac{5}{29}\$Ni \$\f	100	-			Thallium	$^{204}_{81}{ m TI}$	Indium	115 In	Gallium	70 Ga	Aluminium	$^{27}_{13}$ Al	Boron	11 B			8
Group \$\frac{52}{24}\$Cr \$\frac{55}{25}\$Mn \$\frac{56}{26}\$Fe \$\frac{59}{29}\$Co \$\frac{59}{28}\$Ni \$\frac{55}{29}\$Mi \$\frac{56}{29}\$Ni \$\frac{5}{29}\$Ni \$\f	Element Symbol	7			Mercury	$^{201}_{80}\mathrm{Hg}$	Cadmium	112 Cd	Zinc	$^{65}_{30}\mathrm{Zn}$							
Group \$\frac{32}{24} \text{Cr} \frac{55}{25} \text{Mn} \frac{56}{26} \text{Fe} \frac{59}{27} \text{Co} Chromium Manganese Iron Cobalt \$\frac{96}{22} \text{Mo} \frac{56}{35} \text{Fe} \frac{59}{27} \text{Co} Cobalt \$\frac{96}{42} \text{Mo} \frac{101}{33} \text{Rh} \text{Hydrogen} \$\frac{96}{42} \text{Mo} \frac{101}{35} \text{Rh} \text{Rhodium} \$\frac{184}{74} \text{W} \text{186} \text{Re} \text{190} \text{Os \text{192} \text{Ir} Tungsten Rhenium Osmium Iridium Key: Key:	_ Eleine	Ī			Gold	¹⁹⁷ ₇₉ Au	Silver	$^{108}_{47}\mathrm{Ag}$	Copper	64 29 Cu							
Group \$\frac{32}{24} \text{Cr} \frac{55}{25} \text{Mn} \frac{56}{26} \text{Fe} \frac{29}{27} \text{Co} \frac{56}{27} \text{Co} \frac{25}{27} \text{Co} \frac{25}{27} \text{Mn} \frac{56}{26} \text{Fe} \frac{29}{27} \text{Co} \text{Cobalt} \frac{96}{42} \text{Mo} \frac{101}{44} \text{Ru} \text{Ruthenium} \text{Rhodium} \text{Rhodium} \text{Rhodium} \text{Rhodium} \text{Rhodium} \text{Rhodium} \text{Rhodium} \text{Rhodium} \text{Rhodium} \text{Rhodium} \text{Rhodium} \	,	,			Platinum	195 Pt	Palladium	106 Pd	Nickel	⁵⁹ Ni							
Gro	$\frac{\overline{\mathbf{Z}}}{\mathbf{A}}$				Iridium	$^{192}_{77}\mathrm{Ir}$	Rhodium	¹⁰³ Rh	Cobalt	⁵⁹ Co					Hydrogen	H_{1}^{1}	
22 Cr	ber —	 			Osmium	30 OS	Ruthenium	101 44 Ru	Iron	⁵⁶ Fe							dno
Chr Chr Tur 7 7 7 1 18	Atomic number	snumbe			Rhenium	¹⁸⁶ Re	Technetium	99 Tc	Manganese	55 Mn							Gre
Jim Jim A7b	Aton	Mass	Key:		Tungsten	184 W	Molybdenum	⁹⁶ Mo	Chromium	⁵² Cr							
Vanac Vanac Vanac Vanac Vanac Vanac Vanac Tarta					Tantalum	¹⁸¹ Ta	Niobium	93 Nb	Vanadium	51 V 23 V							
48 Ti Titanium 91 Zr 40 Zirconium 179 Hf Hafnium					Hafnium	$^{179}_{72}\mathrm{Hf}$	Zirconium	$^{91}_{40}\mathrm{Zr}$	Titanium	48 Ti							
45 Scandium Scandium Yttrium Yttrium Lanthanum 227 Ac 89 Ac Actinium			Actinium	²²⁷ ₈₉ Ac	Lanthanum	¹³⁹ La	Yttrium	$ m A_{68}^{68}$	Scandium	45 Sc							
Peryllium Beryllium Magnesium Agnesium Calcium Strontium Strontium Strontium Strontium Strontium Barium Barium Radium			Radium	²²⁶ ₈₈ Ra	Barium	137 Ba	Strontium	88 38 Sr	Calcium	⁴⁰ ₂₀ Ca	Magnesium	$^{24}_{12}\mathrm{Mg}$	Beryllium	⁹ ₄ Be			7
Trithium 23 Na 11 Sodium Sodium 39 K Potassium 86 Rb 37 Ks 133 Cs 55 SS Caesium 133 Cs 55 SS Francium			Francium	²²³ Fr	Caesium	133 Cs	Rubidium	86 Rb	Potassium	39 K	Sodium	²³ Na	Lithium	$^{7}_{3}$ Li			-