



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER	CANDIDATE NUMBER		

CHEMISTRY

0620/02

Paper 2

October/November 2008

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

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

Write in dark blue or black pen.

You may need to use a pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, highlighters, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer all questions.

A copy of the periodic table is printed on page 16.

At the end of the examination, fasten all your work securely together.

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

For Examiner's Use		
1		
2		
3		
4		
5		
6		
7		
Total		

This document consists of 16 printed pages.



1 (a) The table gives some information about five elements, A, B, C, D and E. Complete the table by writing either metal or non-metal in the last column.

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element	properties	metal or non-metal
Α	shiny solid which conducts electricity	
В	reddish brown liquid with a low boiling point	
С	a form of carbon which is black in colour and conducts electricity	
D	white solid which is an insulator and has a high melting point	
E	dull yellow solid which does not conduct heat	

u	

(b) De	scribe how	metallic	character	changes	across a Peri	od.
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- 11	ı
L .	ı

(c) Sodium is in Group I of the Periodic Table.

(i)) Draw a diagra	m to show th	ne full ele	ectronic stru	cture of sodium
-----	------------------------	--------------	-------------	---------------	-----------------

[1]

(ii) Complete the equation to show what happens when a sodium atom forms a sodium ion.

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(d) Complete these sentences about the properties of the Group I elements using words

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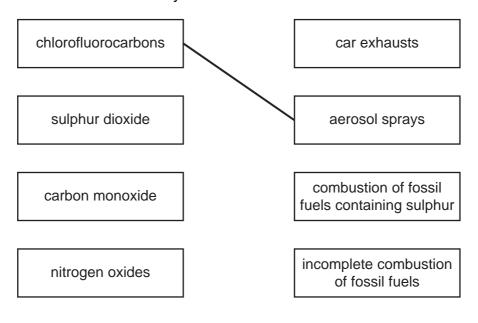
fro	om the list.			·		J	
acidic	basic		decrease		hard		
	increase	lithium		potassium	\$	soft	
The Group	I elements are rela	tively		metals which		in	
reactivity go	oing down the Grou	ıp. Sodium rea	cts more viole	ently with water	than		
The Group	I metals all form		oxide	es.		[4	F
						[Total: 12]	

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2 (a) Match up the atmospheric pollutants on the left with their main source on the right. The first one has been done for you.

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[3]



(b) One stage in the manufacture of sulphuric acid involves the oxidation of sulphur dioxide by oxygen in the air to form sulphur trioxide.

$$2SO_2 + O_2 \longrightarrow 2SO_3$$

(i) Explain how this reaction shows that sulphur dioxide is oxidized.

[1]

(ii) What is the percentage of oxygen in clean air? [1]

(iii) Sulphuric acid is used to make the fertiliser ammonium sulphate.

ammonia + sulphuric acid → ammonium sulphate

What type of reaction is this?

[1]

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(iv)	Why do farmers need to use fertilisers?	For Examiner's Use
	[2]	
(v)	Another fertiliser can be made by the reaction of ammonia with nitric acid. State the chemical name of this fertiliser.	
	[1]	
	[Total: 9]	

_							
3	Calcium carbonate,	CaCO₃	. is the raw	material used in	the manutacture	ot lime. (JaO.

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(a) (i) Describe how lime is manufactured from calcium carbonate.

[1]

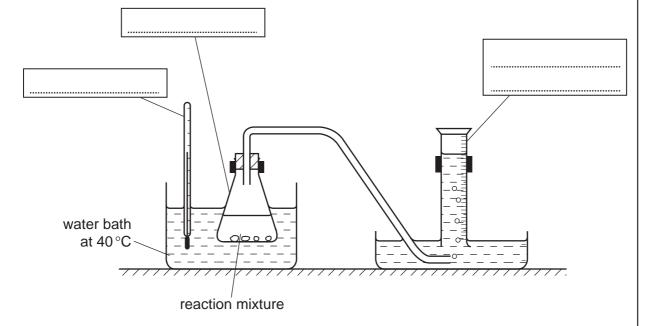
(ii) Write a symbol equation for this reaction.

[1]

(iii) State one large scale use of lime.

[1]

- **(b)** A student investigated the speed of reaction of calcium carbonate with hydrochloric acid using the apparatus shown below.
 - (i) Complete the labelling of the apparatus by filling in the three boxes. [3]



(ii) The equation for the reaction is

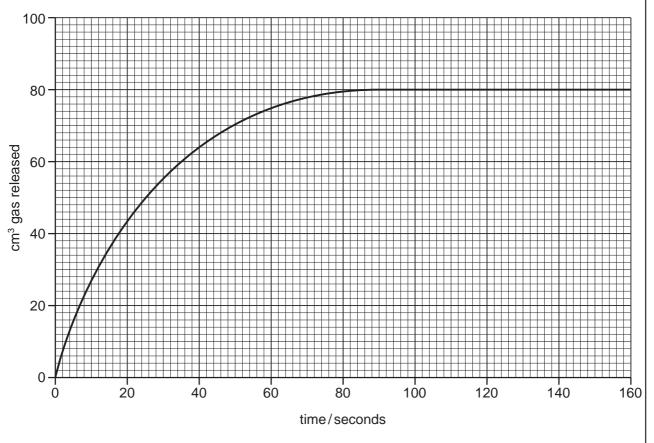
$$CaCO_3 + 2HCl \longrightarrow CaCl_2 + CO_2 + H_2O$$

Write the word equation for this reaction.

[2]

(iii) The student carried out the reaction at 40°C using large pieces of calcium carbonate. The results of the experiment are shown below.

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At what time did the r	reaction	stop?
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11	Ü
ין	١.

- (iv) The student repeated the experiment using the same mass of powdered calcium carbonate. All other conditions were kept the same. On the grid above, sketch the graph for the reaction with calcium carbonate powder. [2]
- (v) How does the speed of reaction change when

the concentration of hydrochloric acid is decreased,

the temperature is increased? [2]

[Total: 13]

		8	
4	Iror	n is extracted from its ore in a blast furnace.	
	(a)	State the name of the ore from which iron is extracted.	
			[1]
	(b)	The diagram shows a blast furnace.	
		firebrick lining B air in C D Which one of the raw materials is added to the blast furnace to help remove the	
		impurities from the iron ore?	F47
			[1]
		(ii) The impurities are removed as a slag. Which letter on the diagram shows the sla	
			[1]
	(c)	Carbon monoxide is formed in the blast furnace by reaction of coke with oxygen.	

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(i) Complete the equation for this reaction.

(ii) State the adverse affect of carbon monoxide on human health.

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[2]

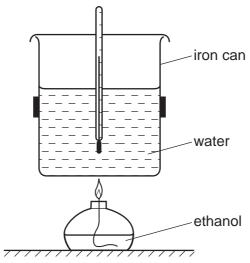
[1]

(d)	In t	he hottest regions of the blast furnace the following reaction takes place.		For Examiner's
		$Fe_2O_3 + 3C \longrightarrow 2Fe + 3CO$		Use
		ich two of these sentences correctly describe this reaction? k two boxes.		
	The	e iron oxide gets reduced.		
	The	e reaction is a thermal decomposition.		
	The	e carbon gets oxidised.		
	The	e carbon gets reduced.		
	Car	rbon neutralises the iron oxide.	[1]	
(e)	Alu	minium cannot be extracted from aluminium oxide in a blast furnace.		
` ,		plain why aluminium cannot be extracted in this way.		
			[2]	
(f)	(i)	State the name of the method used to extract aluminium from its oxide ore.		
			[1]	
	(ii)	State one use of aluminium.		
			[1]	
		[Total	: 11]	

5 The apparatus shown below can be used to measure the energy released when a liquid fuel is burnt. The amount of energy released is calculated from the increase in temperature of a known amount of water.

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[2]



(a)	(i)	Explain how this experiment shows that the burning of ethanol is an exother reaction.	nic
			[1]
	(ii)	Complete the word equation for the complete combustion of ethanol.	
		ethanol + oxygen +	[2]
(b)		anol is a fuel containing carbon. te the names of two other commonly used fuels containing carbon.	
		and	[2]
(c)	Give	e the formula of the functional group present in ethanol.	F43
	•••••		[1]
(d)	The	can contains water. Describe a chemical test for water.	
	tes	t	

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result

(e)	The	e iron can used in this experiment rusts easily.		For
	(i)	Describe a method which can be used to prevent iron from rusting.		Examiner's Use
			[1]	
	(ii)	Rust contains hydrated iron(III) oxide. What do you understand by the term <i>hydrated</i> ?		
			[1]	
	(iii)	Iron is a transition metal. State two properties which are typical of transition metals.		
			 [2]	
		[Total: 1	2]	

6 The compound shown below is the first member of the alkane homologous series.

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ıu,	Ciaic LVV	onana c		OI G	11011101	ouous	301103

		[2]

/h	Name and	draw the structur	a of the nevt	member of the	e alkane homologou	ie sarias
\ N	, manic and	diaw the structur	C OI LIIC IICAL			

name	
------	--

structure

[2]

(c) Complete the table to show the structure and uses of some organic compounds.

name of compound	molecular formula	structure (showing all atoms and bonds)	use
ethene	C₂H₄		
ethanoic acid	C ₂ H ₄ O ₂		making esters
dibromoethane		Br Br H—C—C—H H H	
	CH₄	H H—C—H H	

[6]

(d) Calculate the relative molecular mass of dibromoethane.

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[1]

[Total: 11]

7 The diagram shows the structures of calcium chloride, calcium and chlorine.

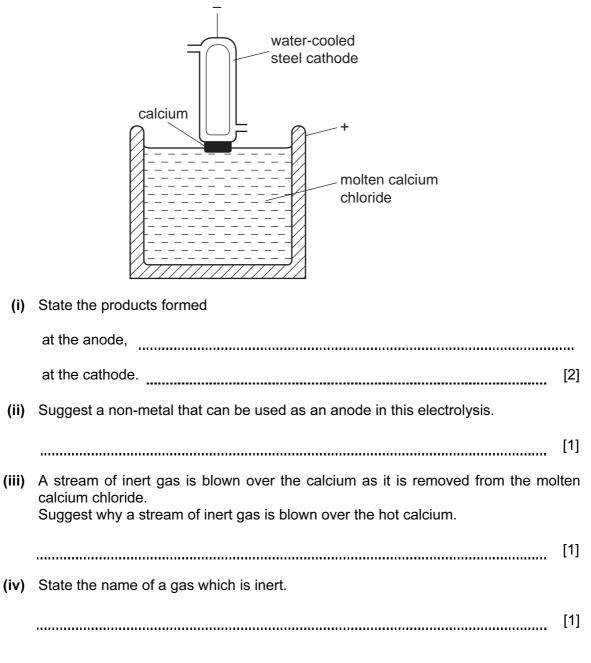
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The diagram shows the	structures of calcium chiloride, calcium a	and chionne.					
(Ca ²⁺) (Ca ²⁺	Ca) (Ca) (Ca) (Ca) (Ca) (Ca) (Ca) (Ca) ($\begin{array}{c} (Cl) \\ (C$					
calcium chloride	calcium	chlorine					
	de conducts electricity when molten but	[2]					
		[21					

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(b) Calcium is manufactured by the electrolysis of molten calcium chloride.





(c) Aqueous sodium hydroxide or aqueous ammonia can be used to test for calcium ions in solution.

Describe the results of these tests

with aqueous sodium hydroxide,	
	[2]
with aqueous ammonia.	
	[1]

[Total: 12]

DATA SHEET
The Periodic Table of the Elements

	0	Heium Heium	20 Neon 10 A0 Argon 18	84 Kry Krypton 36	131 Xe Xenon 54	Radon 86		175 Lu Lutetium 71	Lr Lawrencium 103
•	IIA		19 Fluorine 9 35.5 C1 Chlorine	80 Br Bromine 35	127 I lodine 53	At Astatine 85		173 Yb Ytterbium 70	Nobelium 102
	I		16 O Oxygen 8 32 Sulphur 16	Se Selenium 34	128 Te Tellurium 52	Po Polonium 84		169 Tm Thulium	Md Mendelevium 101
	>		Nitrogen 7 7 31 Phosphorus 15	AS Arsenic	122 Sb Antimony 51	209 Bi Bismuth		167 Er Erbium 68	Fm Fermium 100
	\ <u>\</u>		12 Carbon 6 Silicon 14	73 Ge Germanium 32	119 Sn Tin	207 Pb Lead		165 Ho Holmium 67	Esinsteinium 99
	≡		11 B Boron 5 27 A1 Aluminium 13	70 Ga Gallium	115 In Indium 49	204 T (Thallium		162 Dy Dysprosium 66	Californium 98
				65 Zn 2inc 30	112 Cd Cadmium 48	201 Hg Mercury 80		159 Tb Terbium 65	BK Berkelium 97
				64 Copper	108 Ag Silver 47	197 Au Gold		157 Gd Gadolinium 64	Cm Curium 96
dn				59 N ickel 28	106 Pd Palladium 46	195 Pt Platinum 78		152 Eu Europium 63	Am Americium 95
Group				59 Co Cobalt	103 Rh Rhodium	192 Ir Iridium		Sm Samarium 62	Pu Plutonium 94
		1 Hydrogen		56 Fe Iron	101 Ru Ruthenium 44	190 Os Osmium 76		Pm Promethium 61	Np Neptunium 93
				Mn Manganese 25	Tc Technetium 43	186 Re Rhenium 75		144 Nd Neodymium 60	238 U Uranium 92
				52 Cr Chromium 24	96 Mo Molybdenum 42	184 W Tungsten 74		Pr Pr Praseodymium 59	Pa Protactinium 91
				51 V Vanadium 23	93 Nb Niobium 41	181 Ta Tantalum		140 Ce Cerium	232 Th Thorium
				48 T Ttanium	91 Zr Zirconium 40	178 # Hafnium * 72			nic mass bol nic) number
				Scandium 21	89 Y	139 La Lanthanum 57 *	Actinium Actinium †	l series eries	a = relative atomic mass X = atomic symbol b = proton (atomic) number
	=		Beryllium 4 24 Mgg Magnesium 12	40 Calcium 20	St Strontium	137 Ba Barium 56	226 Ra Radium 88	*58-71 Lanthanoid series 190-103 Actinoid series	« × □
	_		7 Lithium 3 23 Na Sodium 11	39 Potassium	85 R b Rubidium 37	133 Caesium 55	Fr Francium 87	*58-71 L	Key

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

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