

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

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CANDIDATE NAME								
CENTRE NUMBER					CANE NUMI	DIDATE BER		

0620/02 **CHEMISTRY**

Paper 2 May/June 2007

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials 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.

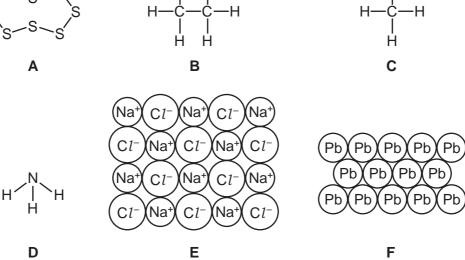
At the end of the examination, fasten all your work securely together.

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 15 printed pages and 1 blank page.





(a) Answer these questions using the letters A to F.

1

(i) Which structure is ethane?
[1]

(ii) Which structure contains ions?
[1]

(iii) Which structure is a gas that turns moist red litmus paper blue?
[1]

(iv) Which structure is sodium chloride?
[1]

(v) Which structure is the main constituent of natural gas?
[1]

(vi) Which two structures are organic compounds?
[1]

(vii) Which two structures are elements?
[1]

[Total: 11]

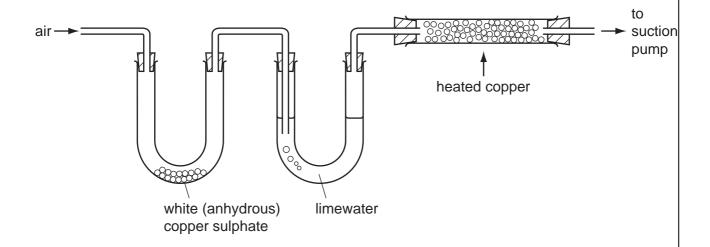
For Examiner's Use **(b)** Structure **F** is lead. (i) What is the source of the small amount of lead present in the air? (ii) State an adverse effect of lead on health. [1] (c) Structure A is sulphur. Explain why burning fossil fuels containing sulphur is harmful to the environment. [2]

2 Clean air contains a number of different gases.

(a)	State the names of the \boldsymbol{two} gases which make up most of the air.

[2]

(b) A sample of air is drawn through the apparatus shown below.



(i) When the air is drawn through the apparatus, the lime water turns milky. Which gas turns lime water milky?

[1]

(ii) The white (anhydrous) copper sulphate turns blue. State the name of the substance which turns white copper sulphate blue.

[1]

(iii) Oxygen is removed from the air by passing it over heated copper. Complete the equation for this reaction.

$$2Cu + \dots \rightarrow CuO$$
 [2]

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5

(c)	Pur	re air contains about 1% argon.	aCan.
	(i)	In which Period of the Periodic Table is argon?	
			[1]
	(ii)	State the name of the Group of elements to which argon belongs.	
			[1]
	, <u>.</u>		
	(iii)	Draw the electronic structure of argon.	
			[1]
	(iv)	Why is argon used in lamps?	
	` ,		[4]
			[1]
	(v)	An isotope of argon has a mass number of 40. Calculate the number of neutrons in this isotope of argon.	
		- concentration and control of the c	F41
			[1]
(d)	Αs	mall amount of xenon is present in the air.	
(4)		ew compounds of xenon have been made in recent years.	
	Cal	culate the relative molecular mass of xenon difluoride, XeF ₂ .	

(e) The structure of another compound of xenon is shown below.



(i)	Write the simplest formula for this compound of xenon.	
		[1]
(ii)	Describe the type of bonding in this compound.	
		[1]
	[Total·	14 ⁻

[4]

- Hydrogen is a fuel which can be obtained from water by electrolysis. Petrol is a fuel obtained by the fractional distillation of petroleum. 3
 - (a) (i) Complete the equation for the burning of hydrogen.

use

		$ H_2 + O_2 \rightarrow H_2O$	[1]
	(ii)	Suggest why hydrogen is a renewable source of energy.	
	i		[1]
		When hydrogen is burnt, heat is given off. State the name of the type of react which gives off heat.	ion
	,		[1]
(b)		ol is a mixture of alkanes. of the alkanes in petrol is octane, C_8H_{18} .	
	Wha	at products are formed when octane is completely burnt in air?	
			[2]
(c)	State	ol is only one of the fractions obtained from the fractional distillation of petroleum e the name of two other fractions obtained from the distillation of petroleum. Give for each of these fractions.	
	frac	etion	
	use		
	frac	tion	

For Examiner's Use (d) More petrol can be made by cracking less useful petroleum fractions. (i) What do you understand by the term cracking? (ii) State two conditions needed for cracking. [2]

(iii) Alkenes can be formed by cracking. The simplest alkene is ethene.

Draw a diagram to show the structure of ethene.

Show all atoms and bonds.

[1]

[Total: 13]

- Catalysts are often used in industry.
 - (a) (i) What do you understand by the term catalyst?

(ii) Which type of metals often act as catalysts?

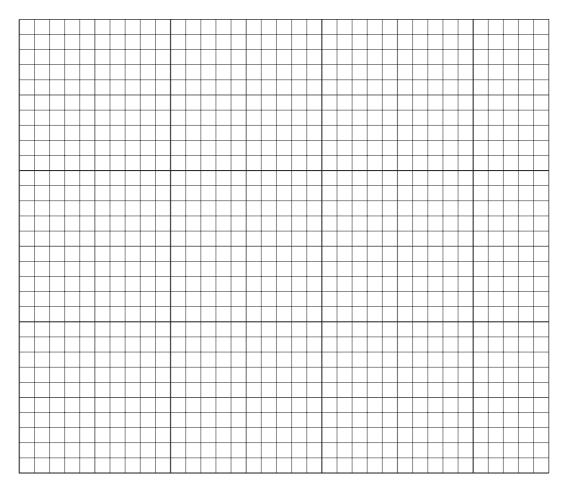
[1]

(b) A student measured the volume of hydrogen gas produced when a few large pieces of zinc reacted with hydrochloric acid of concentration 2.0 mol/dm³. The hydrochloric acid was in excess.

The results are given in the table.

time/minutes	0	10	20	30	40	50	60
volume of hydrogen/cm ³	0	27	54	81	100	110	110

(i) Plot a graph of volume of hydrogen against time on the axes below. Label the axes.



		******	trapapers.com
		10 A. P.	For Examiner's
	(ii)	Copper ions catalyse the reaction between zinc and hydrochloric acid. On the axes above, sketch the line you would expect for the catalysed reac Label this line C .	For Examiner's Use
	(iii)	Explain why no more hydrogen is given off after 50 minutes.	COM
			[1]
(c)	Wh	at would happen to the speed of the reaction if	
	(i)	small pieces of zinc were used instead of large pieces,	
			[1]
	(ii)	the concentration of hydrochloric acid was 1.0 mol/dm ³ ?	
			[1]
(d)	The	e equation for this reaction is	
		$Zn + 2HCl \rightarrow ZnCl_2 + H_2$	
	(i)	State the name of the salt formed in this reaction.	
			[1]
	(ii)	Describe a test for hydrogen.	
		test	
		result	[2]
		[Total	: 14]

[Total: 8]

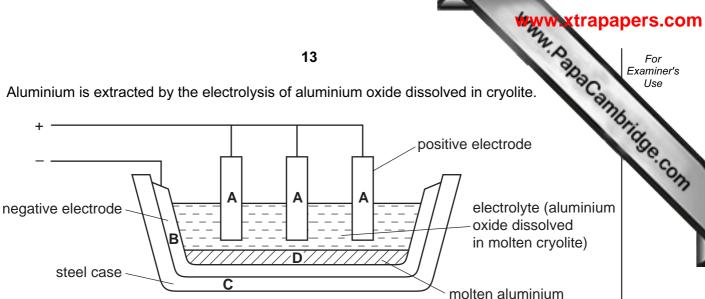
5 Some sunglasses are made from glass which darkens in bright sunlight. The glass contains a sunglasses are made from glass which darkens in bright sunlight. tiny crystals of silver chloride and copper(I) chloride.

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	11 N. P.	For Examiner's
	me sunglasses are made from glass which darkens in bright sunlight. The glass corresponds of silver chloride and copper(I) chloride.	Canny
(a)	In bright sunlight, in the presence of copper(I) chloride, the silver chloride breaks do to solid silver which darkens the glass.	For Examiner's Use
	$Ag^+(s) + e^- \rightarrow Ag(s)$	OM
	State the name of the particle with the symbol e ⁻ .	
		[1]
(b)	Silver is a metal. State two physical properties which are characteristic of all metals.	
		[2]
		[2]
(c)	In bright sunlight, the copper(I) chloride in the sunglasses is converted to copper(II) chloride. What do the roman numerals (I) and (II) show in these copper compounds?	
	Tick one box.	
	the number of atoms of copper in the copper compounds	
	the number of neutrons in the copper compounds	
	whether the copper is in the solid, liquid or gaseous state	
	the oxidation state of the copper in the copper compounds	
		[1]
(d)	Describe a test for aqueous copper(II) ions.	
	test	
	result	
		[3]
(e)	Give a common use of copper.	
. ,	• •	[1]

				www.xtrap	
		12		2.0	
The halogens ar other halide ions	re a group of eleme	nts showing trend	ls in colour, state	and reaction (Contraction)	
(a) Complete the bromide.	e word equation fo	or the reaction of	f chlorine with aq	and reaction ueous potassium	
chlorine + po	otassium bromide —	·	+	[2]	
(b) Explain why	an aqueous solution	of iodine does not	t react with potassi	um chloride.	
***************************************				[1]	
(c) The table sh	ows the properties o	f some halogens.			
halogen	halogen state at room colour boiling point/°C density of so g cm ⁻³				
fluorine	gas	yellow		1.51	
chlorine		green	-35	1.56	
bromine	liquid	red-brown	59		
iodine	solid		184	4.93	
(ii) Suggest	te the missing space	s in the table.		[2]	
	ing point of fluorine,				
	sity of bromine. lectrons does an ato	m of fluorine have		[2]	
(i) in total,	***************************************				
(ii) in its ou	iter shell?			[2]	
(e) State a use t	or chlorine.				
				[1]	

[Total: 10]

Aluminium is extracted by the electrolysis of aluminium oxide dissolved in cryolite.



			1	С			\prec mo	olten alu	minium	
(a)		at informatior ctrolyte?	n in the dia	agram sho	ws that alu	minium is m	ore der	nse than	the	
										[1]
(b)	Wh	at form of cai	bon is use	ed for the	electrodes i	n this electr	olysis?			[41
	•••••		•••••						•••••	[1]
(c)	Wh	ich letter in th	ie diagram	n, A , B , C	or D , repres	sents the an	ode?			
										[1]
(d)		gest why el	ectrolysis	is used	to extract a	aluminium ı	rather 1	than red	duction u	sing
										[1]
(e)	Oxy	∕gen gas is re	eleased at	the anode	Э.					
	(i)	Where does	this oxyge	en come f	rom?					
	(ii)	The oxygen What is the	reacts wit	h the carb						[1]
										[1]
	(iii)	Why does th								ניז
	. ,	,				5				[1]

WANN, PAPAC AMBRIDGE, COM (f) Each electrolysis cell makes 212 kg of aluminium per day from 400 kg of alum Calculate how much aluminium can be made from 1 tonne (1000 kg) of aluminium oxide. [1] (g) Complete the following sentences about the electrolysis of aluminium oxide using words from the following list. molecules atoms gaseous molten solid ions

which are free to move.

Aluminium oxide conducts electricity when it is

contains

[Total: 10]

[2]

because it

15

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DATA SHEET
The Periodic Table of the Elements

								Gre	Group								
_	=								-			≡	≥	>	>	=	0
							1 Hydrogen										4 He Helium
7 Lithium	Be Beryllium	4. €				-						11 Boron	12 Carbon	14 N itrogen 7	16 Oxygen	19 Fluorine	20 Neon 10
23 Na Sodium	24 Mg Magnesium	E										27 A1 Juminium	28 Si Silicon	31 Phosphorus 5	32 S Sulphur	35.5 C1 Chlorine	40 Ar Argon
39 K Potassium	40 Ca Calcium	45 SC m Scandium 21	48 T tanium 22	51 V Vanadium 23	CC Chromium 24	Mn Manganese	56 Fe Iron	59 Co Cobalt	59 Nickel	64 Cu Copper	65 Zn Zinc		73 Ge Germanium	AS Arsenic	79 Se Selenium 34	80 Br Bromine 35	84 K Kypton 36
Rubidium 37	Strontium	89 ×	2r Zirconium 40	Niobium 41	96 Mo Molybdenum 42	Tc Technetium 43	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	122 Sb Antimony	128 Te Tellurium	127 I Iodine	131 Xe Xenon 54
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57	178 Hf Hafnium	181 Ta Tantalum	184 W Tungsten 74	186 Re Rhenium 75	190 OS Osmium 76	192 Ir Iridium	195 Pt Platinum 78	197 Au Gold	201 Hg Mercury	204 T 1 Thallium	207 Pb Lead 82	209 Bi Bismuth	Po Polonium 84	At Astatine 85	Radon 86
Fr Francium 87	226 Ra Radium 88	227 AC M Actinium 89															
*58-71 Lanthanoid serie 190-103 Actinoid series	anthan Actinoi	*58-71 Lanthanoid series 190-103 Actinoid series		140 Ce Cerium	Pr Praseodymium 59	Neodymium 60	Pm Promethium 61	Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	Lu Lutetium
	В	a = relative atomic mass	nic mass														

140 **Ce** Cerium 58 b = proton (atomic) number a = relative atomic mass X = atomic symbol *58-71 Lanthanoid series 190-103 Actinoid series Key

	232 Th	Pa	C 38	aN	Pu	Am	CB	B	ວັ	Es	
_	Thorium 90	Protactinium 91	Uranium 92	Neptunium 93	Plutonium 94	Americium 95	Curium 96	Berkelium 97	Californium 98	Einsteinium 99	100 Fe
	3		!	3		3	3	5	3	3	3
	The vo	olume of	one mole	of any ga	s is 24 dr	n³ at roor	n tempera	he volume of one mole of any gas is $24\mathrm{dm}^3$ at room temperature and pressure (r.t.p.	pressure	(r.t.p.).	