

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	
CHEMISTRY			0620/22
Paper 2			May/June 2012
		1	hour 15 minutes
Candidates an	swer on the Question Paper.		
No Additional N	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.

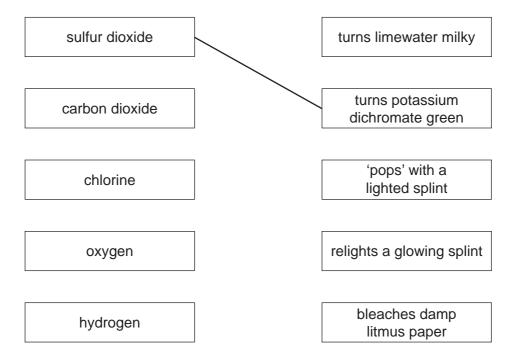
For Exam	iner's Use
1	
2	
3	
4	
5	
6	
7	
Total	

This document consists of 14 printed pages and 2 blank pages.



1 (a) Gases can be identified by carrying out particular tests. Some gases and tests to identify them are shown below. For Examiner's Use

Match the gases on the left with the tests on the right. The first one has been done for you.



[4]

(b) Chlorine can be prepared by heating hydrochloric acid with manganese(IV) oxide.

$$MnO_2 + 4HCl \rightarrow MnCl_2 + Cl_2 + 2H_2O$$

(i) Write a word equation for this reaction.

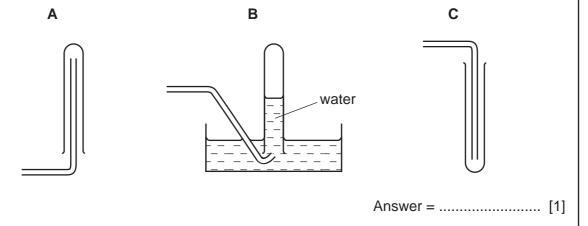
[3]

(ii) Chlorine is

For Examiner's Use

- denser than air
- soluble in water.

Which one of the following diagrams, A, B or C, best describes how chlorine gas is collected?



- (c) Hydrogen reacts with oxygen to form water.
 - (i) Complete the equation for this reaction.

$$2H_2 +H_2O$$
 [2]

(ii) State one use of

hydrogen,	
water.	[2]

[Total: 12]

2 Alkalis are soluble bases.

For Examiner's Use

[Total: 7]

(a) Which **one** of the following is alkaline? Put a ring around the correct answer.

distilled water hydrochloric acid sodium chloride solution sodium hydroxide solution [1] (b) Suggest a pH value for a solution which is alkaline. [1] (c) Describe how you would find the pH of a solution. [2] (d) When excess fertilisers are put on the soil, the soil may become acidic. (i) Why is it important to farmers that the soil does not become too acidic? [1] (ii) Calcium carbonate is used to decrease the acidity of the soil. Explain how calcium carbonate decreases soil acidity.

3 The table below shows some properties of the halogens.

For Examiner's Use

halogen	melting point/°C	boiling point/°C	colour
chlorine	-101	-35	
bromine	-7	+59	
iodine	+114	+184	greyish-black

(a)	(i)	Complete the sp	paces in the table to	show the colours of	chlorine and bromine.	[2]
	(ii)	•	ure is about 20°C. tion in the table to e	explain why		
		chlorine is a gas	at room temperatu	re,		
		bromine is a liqu	uid at room tempera	ture		
((iii)	Astatine is the h		e in the Periodic Table		[-]
						[1]
(b)	Chl	orine reacts with	an aqueous solution	n of potassium iodide		
	(i)	Complete the ba	alanced equation fo	this reaction.		
			Cl_2 +KI \rightarrow	2KC1 +		[2]
	(ii)	State the names	s of the products of	this reaction.		
						[2]
	(iii)	To which period	in the Periodic Tabl	e does chlorine belor	ng?	
						[1]
(c)	Cor	-	ng sentences about	the test for iodide ion	ns using words from the	e list
	h	ydrochloric	nitric	potassium	precipitate	
		silver	solution	white	yellow	
	A sı	mall volume of so	olution containing a	queous iodide ions is	put into a test-tube. Di	ilute
			_		nitrate solut	

[Total: 14]

[4]

A coloured is formed if iodide ions are present.

4 The diagram below shows the structure of some substances containing nitrogen.

For Examiner's Use

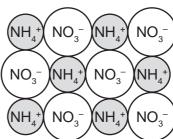
Α

 $N \equiv N$

В

$$H \stackrel{N}{\downarrow} H$$

C



D

Ε

$$C_l \stackrel{N}{\underset{C_l}{\mid}} C_l$$

(a) (i) Which one of these substances, A, B, C, D or E, is an alkaline gas?

(ii) Which one of these substances is an ionic salt?

(iii) Which one of these substances contains a carboxylic acid functional group?

[3]

(b) Oxides of nitrogen such as nitrogen dioxide, NO₂, are atmospheric pollutants. Give **one** source of nitrogen oxides in the air.

......[1]

(c) State one harmful effect of nitrogen dioxide.

.....[1]

(d) Calculate the relative formula mass of nitrogen dioxide, NO₂.

[1]

(e) In the presence of a catalyst, nitrogen dioxide reacts with carbon monoxide.

$$2NO_2 + 4CO \rightarrow N_2 + 4CO_2$$

(i) Which substance gets oxidised during this reaction? Explain your answer.

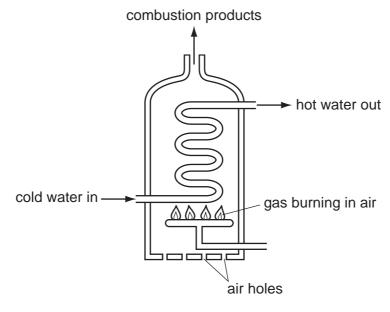
......[2

(ii) What is the meaning of the term *catalyst*?

......[1]

For Examiner's Use

(iii) Carbon monoxide is formed when some of the air holes in a water heater get blocked. The diagram shows a water heater.



	Explain why carbon monoxide is formed when some of the air holes in a water heater get blocked.
(iv)	Explain why carbon monoxide is dangerous.
	[1]

[Total: 12]

For

Examiner's Use

reacts with sulfuric acid.
$Fe + H_2SO_4 \rightarrow FeSO_4 + H_2$
Write a word equation for this reaction.
Describe, with the aid of a diagram, how you could measure the speed of t reaction. In your answer describe:
 the apparatus you would use the measurements you would take.
the measurements you would take.
en iron reacts with sulfur, energy is released.

For Examiner's Use

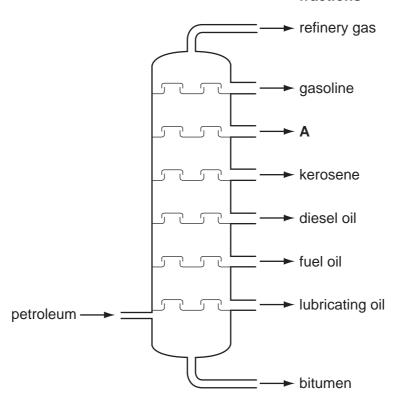
(ii)	The compound formed in this reaction is iron(II) sulfide. What do you understand by the term <i>compound</i> ?
	[1]
(iii)	The diagram below shows the structure of iron(II) sulfide.
	Fe atoms S atoms What is the simplest formula for iron(II) sulfide?
	[1]
	[Total: 12]

© UCLES 2012 0620/22/M/J/12 **[Turn over**

6 The diagram shows a fractionating column used to separate different hydrocarbon fractions in an oil refinery.

For Examiner's Use





- (a) On the diagram, draw an X to show the place in the column where the temperature is the highest.
- (b) State the name of the fraction labelled A.

.....[1]

(c) State a use for

the kerosene fraction,

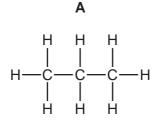
the diesel oil fraction. [2]

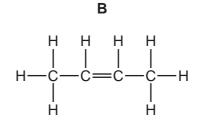
(d) Complete the following sentences about fractional distillation using words from the list below.

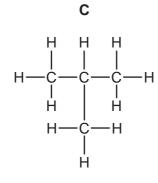
For Examiner's Use

	boiling condenses		cool	ed he	eated	higher			
	I	ower	me	elting	mixtu	ire pre	ssure	vaporises	
Petro	leun	n is a			of hydr	ocarbons.	This mix	ture is	
and	the	hydrocai	bons	vaporise.	The t	emperature	in the	fractionating	column is
			at the	top than	at the b	ottom. As t	he vapo	urs move up t	he column,
each	hyd	rocarbon	fraction	on		when th	e tempe	rature in the c	column falls
below	/ the	·		point o	of the hy	/drocarbon	fraction.		[5]

(e) The structures of four hydrocarbons, A, B, C and D, are shown below.







- (i) Which two of these structures A, B, C or D have the same relative molecular mass? and[1]
- (ii) Which two of these structures A, B, C or D will decolourise aqueous bromine?

[Total: 12]

7 A student placed some crystals of salt at the bottom of a beaker of distilled water. She left the contents of the beaker to stand for one hour. The diagram below shows her observations. For Examiner's Use

distilled water			
salt crystals	at start	after 15 minutes	after 1 hour
After one hour, all	the salt had disappeared	d but the solution at point X ta	sted salty.
(a) Use the kineti	ic particle theory to expla	in these observations.	
			[4]

(b) Salt is sodium chloride, NaCl.

(i)	Which of	one o	of the	following	statements	about	bond	formation	in	sodium	chloride	is
	true?											

Tick **one** box.

A sodium atom shares one electron with a chlorine atom.	
---	--

A sodium atom loses its outermost electron and a chlorine atom gains an electron.

A sodium atom shares two electrons with a chlorine atom.

A sodium atom gains an electron and a chlorine atom loses its outermost electrons.

[1]

For Examiner's Use

(ii)	Explain why solid sodium chloride does not conduct electricity but molten sodium chloride does conduct.							
						[2	2]	
(iii)	State the name of aqueous solution of	•					d	
	at the positive electrode							
	at the negative electrode[2]							
(iv)	What is the name of the negative electrode? Put a ring around the correct answer.							
	anion an	ode	cation	cathode	electrolyte	[1	1]	
(v)	Suggest why grap	hite is a sui	table materia	l for an electr	ode.			
						[1	1]	
						[Total: 11	1]	

14

BLANK PAGE

15

BLANK PAGE

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

DATA SHEET
The Periodic Table of the Elements

Group	0	4 He Helium	20 Ne Neon 10	40 Ar Argon	84 Kr Krypton 36	131 Xe Xenon 54	Radon 86		Lutetium 71	Lr Lawrendum 103			
	II/		19 F Fluorine	35.5 C1 Chlorine	80 Br Bromine 35	127	At Astatine 85		173 Yb Ytterbium 70	Nobelium			
	I		16 Oxygen	32 S Suffur	Se Selenium 34	128 Te Tellurium	Po Polonium 84		169 Tm Thulium	Md Mendelevium 101			
	> ≥		14 Nitrogen 7	31 P Phosphorus 15	75 AS Arsenic 33	Sb Antimony 51	209 Bi Bismuth		167 Er Erbium 68	Fm Fermium			
					12 C Carbon 6	28 Si Silicon	73 Ge Germanium 32	119 Sn IIn	207 Pb Lead 82		165 Ho Holmium 67	ES Einsteinium 99	
	=		11 Boron 5	27 A t Aluminium 13	70 Ga Gallium 31	115 I n Indium 49	204 T t Thallium 81		162 Dy Dysprosium 66	Cf Californium 98			
					65 Zn Zinc 30	Cd Cadmium 48	201 Hg Mercuny 80		159 Tb Terbium 65	BK Berkelium 97			
				,	64 Copper	108 Ag Silver 47	197 Au Gold		157 Gd Gadolinium 64	Cm Curium			
					59 X Nickel	106 Pd Palladium 46	195 Pt Platinum 78		152 Eu Europium 63	Am Americium 95			
					59 Cobalt	Rhodium 45	192 F		150 Sm Samarium 62	Pu Plutonium 94			
		1 T Hydrogen			56 Fe Iron 26	Ruthenium	190 Os Osmium 76		Pm Promethium 61	Neptunium			
					Mn Manganese 25	Tc Technetium 43	186 Re Rhenium 75		144 Ne Neodymium 60	238 U Uranium			
								52 Cr Chromium 24	96 Mo Molybdenum 42	184 W Tungsten 74		Pr Praseodymium 59	Pa Protactinium 91
					51 V Vanadium 23	93 Nb Niobium 41	181 Ta Tantalum 73		140 Ce Cerium	232 Th Thorium 90			
					Titanium 22 Titanium 27 Zr Zirconium 40 Tit8 Hetrium 178 Tit7 Hetrium			nic mass bol nic) number					
				Scandium	89 Y	139 La Lanthanum 57 *	227 Ac Actinium 89	Series	a = relative atomic mass X = atomic symbol b = proton (atomic) number				
	=		Beryllium	Mg Magnesium	40 Ca Calcium	Strontium	137 Ba Barium 56	226 Ra Radium	*58-71 Lanthanoid series 190-103 Actinoid series	« × ¤			
	_		7 Li Lithium	Na Sodium	39 K Potassium	Rubidium 37	133 CS Caesium 55	Fr Francium 87	*58-71 L	Key			

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included the publisher will be pleased to make amends at the earliest possible opportunity.

University of Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.