

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

NS AND COMPAGE COMP

CHEMISTRY 0620/13

Paper 1 Multiple Choice October/November 2013

45 Minutes

Additional Materials: Multiple Choice Answer Sheet

Soft clean eraser

Soft pencil (type B or HB is recommended)

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

DO NOT WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.

Choose the one you consider correct and record your choice in soft pencil on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 20.

Electronic calculators may be used.

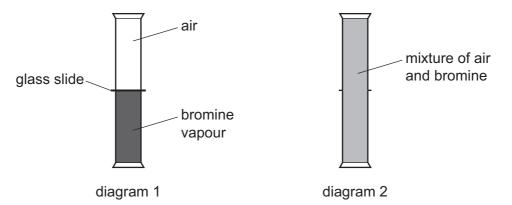
This document consists of ${\bf 19}$ printed pages and ${\bf 1}$ blank page.



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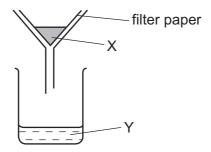
1 A gas jar of bromine vapour and a gas jar of air are set up as shown in diagram 1.

The glass slide is removed. Diagram 2 shows the appearance of the gas jars after one hou



Which statement explains why the bromine and air mix together?

- A Bromine is denser than air.
- **B** Bromine is lighter than air.
- **C** Bromine molecules moved upwards and molecules in air moved downwards.
- **D** Molecules in bromine and air moved randomly.
- 2 The diagram shows a method for separating a substance that contains X and Y.



Which types of substance can be separated as shown?

- A compounds
- **B** elements
- **C** mixtures
- **D** molecules

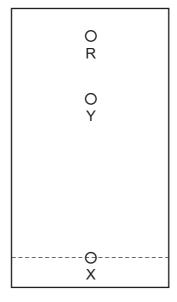
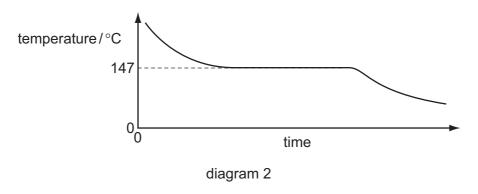


diagram 1

Diagram 2 shows the cooling curve for substance Y.



Which statement about X and Y is correct?

- **A** X is a mixture and Y is a pure substance.
- **B** X is a pure substance and Y is a mixture.
- C X and Y are mixtures.
- **D** X and Y are pure substances.

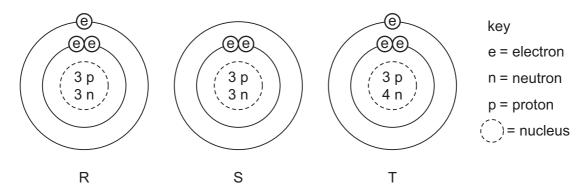
The atomic structures of four atoms are shown.

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			4		W. Day
·u	ctures of	four atoms are sh	nown.		VaCan.
	atom	number of neutrons	number of protons	number of electrons	www.PanaCambridge.com
	W	6	6	6	COM
	Χ	7	7	7	
	Υ	8	6	6	
	Z	8	8	8	L. L.

Which pair of atoms are isotopes?

- A W and X
- **B** W and Y
- C X and Y
- **D** Y and Z

The diagram shows the structure of three particles, R, S and T. 5

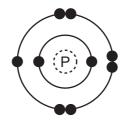


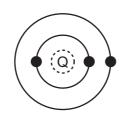
Which row describes these particles?

	ions	isotopes	
Α	R	S and T	
В	R and S	Т	
С	S	R and T	
D	Т	R and S	

- 6 Which statement about the bonding in a molecule of water is **not** correct?
 - Both hydrogen and oxygen have a noble gas configuration of electrons. Α
 - Each hydrogen shares its one electron with oxygen. В
 - C Oxygen shares one of its own electrons with each hydrogen.
 - D Oxygen shares two of its own electrons with each hydrogen.

7 The electronic structures of atoms P and Q are shown.



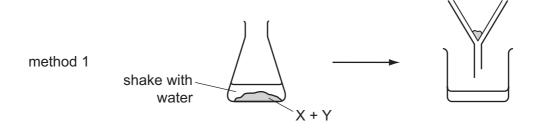


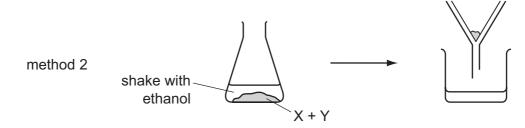
P and Q react to form an ionic compound.

What is the formula of the compound?

- **A** Q₇P
- **B** QP
- C QP₃
- **D** QP₇
- 8 A solid mixture contains an ionic salt, X, and a covalent organic compound, Y.

Two students suggest methods of separating the mixture as shown.





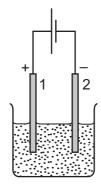
Which methods of separation are likely to work?

	1	2
Α	✓	✓
В	✓	X
С	X	✓
D	X	X

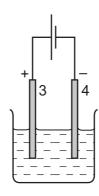
	molecule	$M_{\rm r}$
A ammonia, NH ₃		17
В	B carbon dioxide, CO ₂	
С	C methane, CH₄	
D	oxygen, O ₂	16

10 Two electrolysis experiments were carried out as shown in the diagram below.

The graphite electrodes are labelled 1-4.



molten sodium chloride



concentrated aqueous sodium chloride

Which row describes the products at the electrodes in these experiments?

	electrode 1	electrode 2	electrode 3	electrode 4
Α	chlorine	hydrogen	chlorine	hydrogen
В	chlorine	sodium	chlorine	hydrogen
С	chlorine	sodium	hydrogen	chlorine
D	sodium	chlorine	sodium	chlorine

11 One molten compound and two aqueous solutions were electrolysed.

The table gives the compounds electrolysed and the electrodes used.

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ηŗ	oound a	and two aqueous solutions were ele	ectrolysed.	acan.
th	ne com	pounds electrolysed and the electro	odes used.	did
		substance electrolysed	electrodes	Se.Co.
	1	concentrated hydrochloric acid	carbon	
	2	concentrated sodium chloride	platinum	•
	3	molten lead bromide	platinum	

In which experiments is a gas evolved at the cathode?

- **A** 1, 2 and 3
- **B** 1 and 2 only
- 1 only
- 3 only

12 When ammonium nitrate is added to water the temperature of the water decreases.

The ammonium nitrate can be recovered by evaporating the water added.

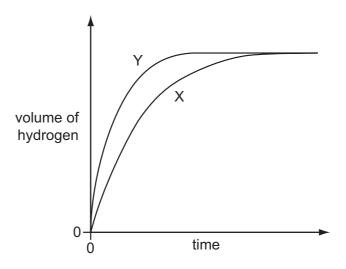
Which explains these observations?

- The ammonium nitrate dissolves in the water and the process is endothermic.
- The ammonium nitrate reacts with the water and the process is endothermic.
- C The ammonium nitrate dissolves in the water and the process is exothermic.
- D The ammonium nitrate reacts with the water and the process is exothermic.
- 13 Which substance could **not** be used as a fuel to heat water in a boiler?
 - A ethanol
 - **B** hydrogen
 - **C** methane
 - oxygen
- **14** Which substance is not a fossil fuel?
 - **A** coal
- kerosene
- gasoline
- wood

of sulfuric acle Cannonide Con

15 A student investigates the rate of reaction between zinc and an excess of sulfuric acid

The graph shows the results of two experiments, X and Y.



Which change explains the difference between X and Y?

- A A catalyst is added in Y.
- **B** A lower temperature is used in Y.
- **C** Larger pieces of zinc are used in Y.
- **D** Less concentrated acid is used in Y.
- When green iron(II) sulfate is heated, it turns white and a colourless liquid is produced. When the liquid is put back into the white solid it changes back to green.

What type of reaction takes place and what is the name of the liquid?

	type of reaction	name of liquid	
Α	redox	sulfuric acid	
В	redox	water	
С	reversible	sulfuric acid	
D	reversible	water	

17 The reactions shown may occur in the air during a thunder storm.

$$N_2 + O_2 \rightarrow 2NO$$

 $2NO + O_2 \rightarrow 2NO_2$

NO +
$$O_3 \rightarrow NO_2$$
 + O_2

Which row shows what happens to the reactant molecules in each of these reactions?

	N ₂	NO	O ₃
Α	oxidised	oxidised	oxidised
В	oxidised	oxidised	reduced
С	reduced	reduced	oxidised
D	reduced	reduced	reduced

- 18 Which are properties of an acid?
 - 1 reacts with ammonium sulfate to form ammonia
 - 2 turns red litmus blue

	1	2
Α	✓	✓
В	✓	x
С	x	✓
D	X	X

19 Which of the following are properties of the oxides of non-metals?

	property 1	property 2	
Α	acidic	covalent	
В	acidic	ionic	
С	basic	covalent	
D	basic	ionic	

www.PapaCambridge.com 20 The cations shown are identified by the colour of the precipitates formed when an aqueous solution of X is added.

cations present	effect of adding an excess of aqueous X
iron(II) (Fe ²⁺)	green precipitate
copper(II) (Cu ²⁺)	light blue precipitate
iron(III) (Fe ³⁺)	red-brown precipitate

What is X?

- A ammonia
- В limewater
- C silver nitrate
- **D** sodium hydroxide
- 21 Calcium, on the left of Period 4 of the Periodic Table, is more metallic than bromine on the right of this period.

Why is this?

Calcium has

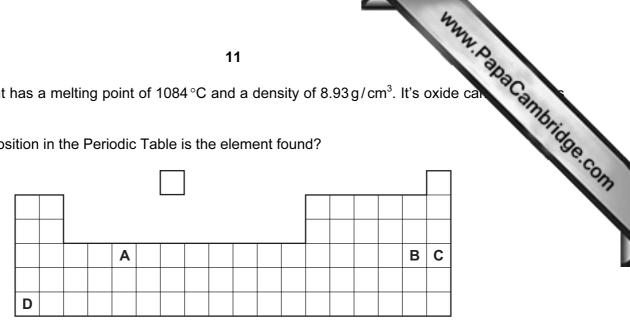
- A fewer electrons.
- **B** fewer protons.
- **C** fewer full shells of electrons.
- **D** fewer outer shell electrons.
- 22 The diagrams show the labels of four bottles.

Which label is **not** correct?

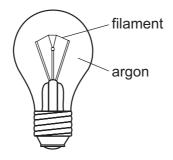
Α	В	c	D
Bromine Br ₂	lodine I ₂	Potassium K	Sodium Na
Harmful liquid. Do not spill.	Danger Avoid breathing vapour from the solid.	Danger Store under water.	Danger Store under oil.

23 An element has a melting point of 1084 °C and a density of 8.93 g/cm³. It's oxide can a catalyst.

In which position in the Periodic Table is the element found?



24 The diagram shows a light bulb.



Why is argon used instead of air in the light bulb?

- **A** Argon is a good conductor of electricity.
- **B** Argon is more reactive than air.
- **C** The filament glows more brightly.
- **D** The filament does not react with the argon.
- **25** Duralumin is an alloy. It contains aluminium, copper and magnesium.

It has many uses including the manufacture of cooking utensils and ships.

Which statement about duralumin and its properties is correct?

- It is a good conductor of electricity.
- It is brittle. В
- It is soluble in water. C
- D The aluminium, copper and magnesium are chemically combined.

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www.PapaCambridge.com 26 The list gives the order of some metals (and hydrogen) in the reactivity series.

Metal X is also included:

Most reactive

Κ

Mg

Zn

(H)

Χ

Least reactive Cu

Which row correctly shows the properties of metal X?

	reacts with dilute acids	oxide reduced by carbon			
Α	no	no			
В	no	yes			
С	yes	no			
D	yes	yes			

27 A new bicycle is being developed.

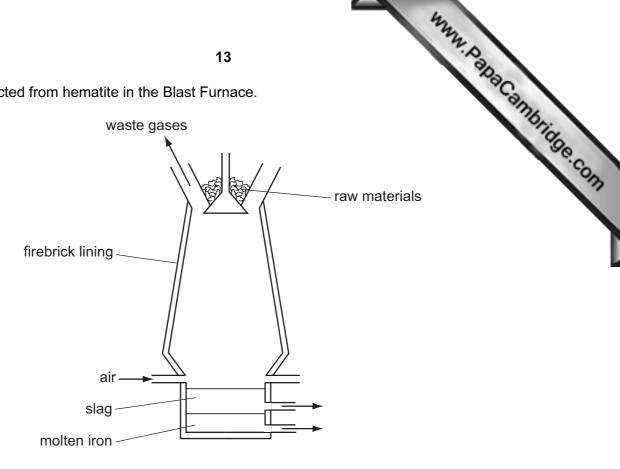
Two different materials are used in its construction, both of which must be corrosion resistant.



Which two metals could be used?

- aluminium and mild steel Α
- aluminium and stainless steel В
- C mild steel and pure iron
- pure iron and stainless steel D

28 Iron is extracted from hematite in the Blast Furnace.



The hematite contains silica as an impurity.

What reacts with this impurity to remove it?

- calcium oxide
- В carbon
- C carbon dioxide
- D oxygen
- 29 In which process is carbon dioxide not formed?
 - burning of natural gas
 - В fermentation
 - C heating lime
 - respiration D

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30 Carbon dioxide is produced when

X reacts with ethanol.

Y reacts with sodium carbonate.

What are X and Y?

	X	Υ
Α	H_2	HC1
В	H_2	NaOH
С	O_2	HC1
D	O_2	NaOH

31 A sample of fertiliser is tested by warming it with aqueous sodium hydroxide.

A colourless gas is produced which turns red litmus paper blue.

Which element, essential for plant growth, must be present?

- A nitrogen
- **B** phosphorus
- C potassium
- **D** sulfur
- 32 Iron rusts. This process involves the1..... of iron. Rusting can be prevented by covering the iron with grease or paint which stops2..... from reaching the surface of the iron.

Which words correctly complete gaps 1 and 2?

	1	2
Α	oxidation	nitrogen
В	oxidation	oxygen
С	reduction	nitrogen
D	reduction	oxygen

33 Oxides of nitrogen are given out from car exhausts.

Which row best shows why oxides of nitrogen are unwanted?

	acidic	toxic				
Α	no	no				
В	no	yes				
С	yes	no				
D	yes	yes				

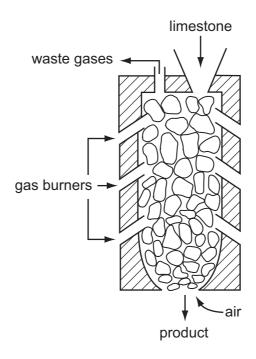
34 Water is treated at a water works to make it fit to drink.

What is present in the water when it leaves the waterworks?

- A bacteria only
- **B** bacteria and insoluble substances
- C chlorine only
- **D** chlorine and soluble substances

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35 The diagram shows a kiln used to heat limestone.



What is the product and what waste gas is formed?

	product	waste gas			
Α	lime, CaO	carbon monoxide			
В	lime, CaO	carbon dioxide			
С	slaked lime, Ca(OH) ₂	carbon monoxide			
D	slaked lime, Ca(OH) ₂	carbon dioxide			

36 Molecule X is both an alkene and a carboxylic acid.

Which row describes X?

	saturated	-COOH present
Α	no	no
В	no	yes
С	yes	no
D	yes	yes

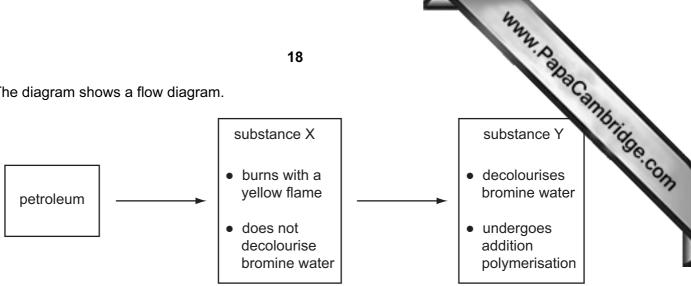
- 37 Which hydrocarbon reacts with steam to produce ethanol?
 - $\mathbf{A} \quad \mathbf{C}_2\mathbf{H}_4$
- \mathbf{B} C_2H_6
- \mathbf{C} C_3H_6
- \mathbf{D} $\mathbf{C}_3\mathbf{H}_8$

www.PapaCambridge.com Which process is used to separate the petroleum into groups of similar hydrocarbons?

- Α combustion
- В cracking
- C fractional distillation
- reduction D

39 Which row represents compounds in the same homologous series?

40 The diagram shows a flow diagram.



Which type of organic compounds are X and Y?

	substance X	substance Y
Α	alcohol	alkane
В	alkane	alkene
С	alkene	alkane
D	alkane	alcohol

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The Periodic Table of the Elements DATA SHEET

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	0	Helium	20 Ne on 10	40 Ar Argon	84 Kr Krypton 36	131 Xe Xenon 54	Rn Radon 86		175 Lu Lutetium 71	Lr Lawrencium 103	S. GAMBA	-
157	 		19 F Fluorine	35.5 C1 Chlorine	80 Br Bromine	127 T lodine	At Astatine 85		173 Yb Ytterbium 70	Nobelium 102	The state of the s	0.0
5	>		16 Oxygen 8	32 S Sulfur 16	79 Se Selenium 34	128 Te Tellurium	Po Polonium 84		Tm Thulium 69	Md Mendelevium 101		•
;	>		14 N itrogen 7	31 P Phosphorus 15	75 As As	122 Sb Antimony 51	209 Bi Bismuth 83		167 Er Erbium 68	Fm Fermium		
2	≥		12 C Carbon 6	28 Si icon 14	73 Ge Germanium	Sn Tin	207 Pb Lead 82		165 Ho Holmium 67	Ensteinium	e (r.t.p.).	
=	=		11 Boron 5	27 A1 Auminium 13	70 Ga Gallium	115 In Indium	204 T 1 Thallium 81		162 Dy Dysprosium 66	Cf Californium 98	The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).	
					65 Zn Zinc 30	Cadmium Cadmium 48	201 Hg Mercury		159 Tb Terbium	BK Berkelium 97	rature and	
					64 Cu Copper	108 Ag Silver 47	197 Au Gold		157 Gd Gadolinium 64	Cm Curium	om tempel	
Group					59 Nickel 28	106 Pd Palladium	195 Pt Platinum 78		152 Eu Europium 63	Am Americium	lm³ at roc	
<u>פֿ</u>					59 Co Cobalt	Rhodium 45	192 Ir Iridium 77		Sm Samarium 62	Pu Plutonium 94	as is 24 c	
		1 Hydrogen			56 Te Iron	Ruthenium 44	190 Os Osmium 76		Pm Promethium 61	Np Neptunium 93	e of any g	
					Manganese	Tc Technetium	186 Re Rhenium		144 Nd Neodymium 60	238 C Uranium	one mole	
					Cr Chromium 24	96 Mo Molybdenum 42	184 W Tungsten 74		Pr Praseodymium 59	Pa Protactinium 91	volume of	
					51 Vanadium 23	Niobium 41	181 Ta Tananum 73		140 Cer ium 58	232 Th Thorium	The	
					48 Ti Titanium	91 Zr Zirconium 40	178 Hf Hafnium * 72	+	1	omic mass nbol mic) number		
		I			Scandium 21	89 ×	139 La	227 Ac Actinium	d series series	a = relative atomic mass X = atomic symbol b = proton (atomic) number		
=	=		9 Beryllium 4	24 Mg Magnesium	40 Ca Calcium	88 Sr Strontium	137 Ba Barium 56	226 Ra Radium 88	*58-71 Lanthanoid series 190-103 Actinoid series	∞ ×		
-	_		7 Li Lithium 3	23 Na Sodium	39 K Potassium	Rb Rubidium	Caesium 55	Francium 87	*58-711	Key		

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