

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

CHEMISTRY 0620/13

Paper 1 Multiple Choice October/November 2010

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.

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 16.

You may use a calculator.

This document consists of 16 printed pages.









1 In which changes do the particles move further apart?

$$\begin{array}{ccc} & W & X \\ \text{gas} & \rightleftharpoons & \text{liquid} & \rightleftharpoons & \text{solid} \\ & Y & & 7 \end{array}$$

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

2 The table shows the structure of different atoms and ions.

particle	proton number	nucleon number	number of protons	number of neutrons	number of electrons
Mg	12	24	12	W	12
Mg ²⁺	X	24	12	12	10
F	9	19	9	Υ	9
F ⁻	9	19	9	10	Z

What are the values of W, X, Y and Z?

	W	Х	Y	Z
Α	10	10	9	9
В	10	12	10	9
С	12	10	9	10
D	12	12	10	10

3 Element X has a nucleon (mass) number of 19 and a proton (atomic) number of 9.

To which group in the Periodic Table does it belong?

- A I
- B III
- C VII
- **D** 0

4 A mixture of ethanol and methanol are separated by fractional distillation.

This method of separation depends on a difference in property X of these two alcohols.

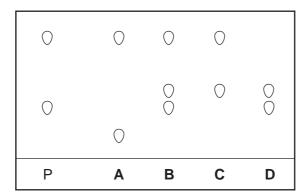
What is property X?

- A boiling point
- **B** colour
- **C** melting point
- **D** solubility

5 Chromatography is used to find out if a banned dye, P, is present in foodstuffs.

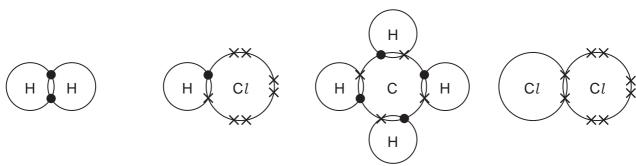
The results are shown in the diagram.

Which foodstuff contains P?



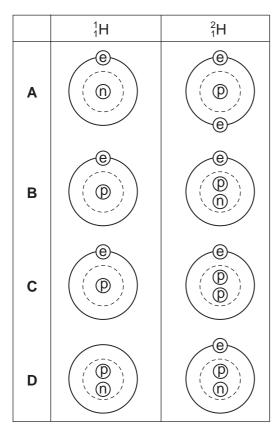
Which diagram does **not** show the outer shell electrons in the molecule correctly? 6





7 Two isotopes of hydrogen are ${}_{1}^{1}H$ and ${}_{1}^{2}H$.

Which diagram shows the arrangement of particles in the two isotopes?



key

- (e) = an electron
- (p) = a proton
- (n) = a neutron
- = a nucleus

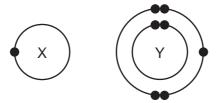
8 The chemical compositions of two substances, W and X, are given.

- W Na(AlSi₃)O₈
- X Ca(Al₂Si₂)O₈

Which statements are correct?

- 1 W and X contain the same amount of oxygen.
- 2 W contains three times as much silicon as X.
- 3 X contains twice as much aluminium as W.
- **A** 1 and 2
- **B** 1 and 3
- **C** 2 and 3
- **D** 1, 2 and 3

9 The electronic structures of atoms X and Y are shown.



X and Y form a covalent compound.

What is its formula?

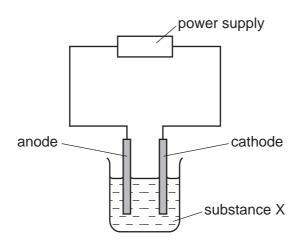
- $\mathbf{A} \quad XY_5$
- $B XY_3$
- C XY
- $D X_3Y$
- **10** Element X is shiny and can be formed into a sheet by hammering.

Which row correctly describes the properties of element X?

	conducts electricity	melts below 25 °C
Α	✓	✓
В	✓	X
С	×	✓
D	x	X

11 Substance X was electrolysed in an electrolytic cell.

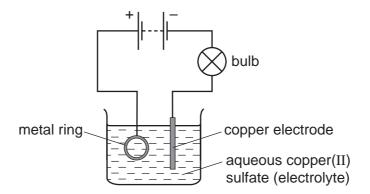
A coloured gas was formed at the anode and a metal was formed at the cathode.



What is substance X?

- A aqueous sodium chloride
- B molten lead bromide
- C molten zinc oxide
- D solid sodium chloride

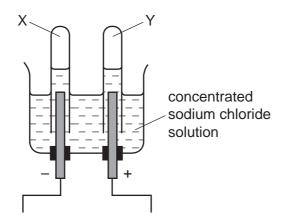
12 The diagram shows apparatus used in an attempt to electroplate a metal ring with copper.



The experiment did not work.

What change is needed in the experiment to make it work?

- **A** Add solid copper(II) sulfate to the electrolyte.
- **B** Increase the temperature of the electrolyte.
- **C** Replace the copper electrode by a carbon electrode.
- **D** Reverse the connections to the battery.
- 13 When concentrated sodium chloride solution is electrolysed, elements X and Y are formed.



What are X and Y?

	Х	Y
Α	chlorine	hydrogen
В	hydrogen	chlorine
С	hydrogen	oxygen
D	oxygen	hydrogen

14 Calcium carbonate was reacted with hydrochloric acid in a conical flask. The flask was placed on a balance and the mass of the flask and contents was recorded as the reaction proceeded.

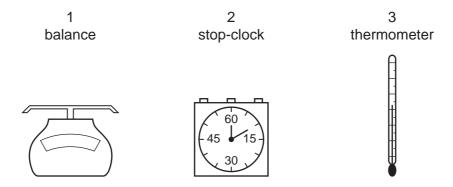
During the reaction, carbon dioxide gas was given off.

The reaction was carried out at two different temperatures.

Which row is correct?

	change in mass	temperature at which mass changed more quickly
Α	decrease	higher temperature
В	decrease	lower temperature
С	increase	higher temperature
D	increase	lower temperature

- 15 Which is an endothermic process?
 - A burning hydrogen
 - **B** distilling petroleum
 - C reacting potassium with water
 - D using petrol in a motor car engine
- **16** The diagrams show some pieces of laboratory equipment.



Which equipment is needed to find out whether dissolving salt in water is an endothermic process?

A 1 only **B** 1 and 3 **C** 2 and 3 **D** 3 only

- 17 Which reaction will result in a decrease in pH?
 - A adding calcium hydroxide to acid soil
 - **B** adding citric acid to sodium hydrogen carbonate solution
 - **C** adding sodium chloride to silver nitrate solution
 - **D** adding sodium hydroxide to hydrochloric acid
- 18 When pink crystals of cobalt(II) chloride are heated, steam is given off and the colour of the solid changes to blue.

$$CoCl_2.6H_2O \rightleftharpoons CoCl_2 + 6H_2O$$

What happens when water is added to the blue solid?

	colour	temperature
Α	changes to pink	decreases
В	changes to pink	increases
С	remains blue	decreases
D	remains blue	increases

19 The red colour in some pottery glazes may be formed as a result of the reactions shown.

$$CuCO_3 \xrightarrow{\text{heat}} CuO + CO_2$$

$$CuO + SnO \longrightarrow Cu + SnO_2$$

These equations show that1..... is oxidised and2..... is reduced.

Which substances correctly complete gaps 1 and 2 in the above sentence?

	1	2
Α	CO ₂	SnO ₂
В	CuCO ₃	CuO
С	CuO	SnO
D	SnO	CuO

20 Some barium iodide is dissolved in water.

Aqueous lead(II) nitrate is added to the solution until no more precipitate forms.

This precipitate, X, is filtered off.

Dilute sulfuric acid is added to the filtrate and another precipitate, Y, forms.

What are the colours of precipitates X and Y?

	Х	Y
Α	white	white
В	white	yellow
С	yellow	white
D	yellow	yellow

21 The table shows some reactions of the halogens.

Which reaction is the most likely to be explosive?

reaction	chlorine gas	bromine gas	iodine gas
reaction with hydrogen	Α	В	С
reaction with iron	very vigorous	less vigorous	D

22	Which c	ompound	is likel	y to b	e coloured?
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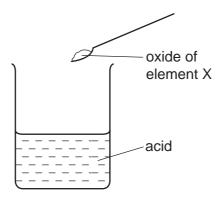
	Α	$KMnO_4$	В	KNO_3	С	K_2CO_3	
--	---	----------	---	---------	---	-----------	--

23 A salt is made by adding an excess of an insoluble metal oxide to an acid.

How can the excess metal oxide be removed?

- A chromatography
- crystallisation
- **C** distillation
- **D** filtration

24 The oxide of element X was added to an acid. It reacted to form a salt and water.

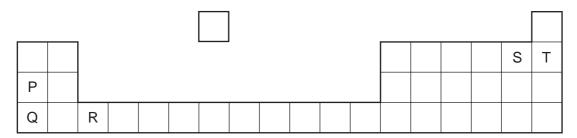


What is the pH of the acid before the reaction and what type of element is X?

	рН	type of element X
Α	greater than 7	metal
В	greater than 7	non-metal
С	less than 7	metal
D	less than 7	non-metal

25 The diagram shows the positions of elements P, Q, R, S and T in the Periodic Table.

These letters are not the chemical symbols for the elements.



Which statement about the properties of these elements is correct?

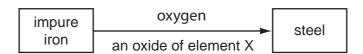
- A P reacts more vigorously with water than does Q.
- **B** P, Q and R are all metals.
- C T exists as diatomic molecules.
- **D** T is more reactive than S.

26 The table compares the properties of Group I elements with those of transition elements.

Which entry in the table is correct?

	property	Group I elements	transition elements		
Α	catalytic activity	low	high		
В	density	high	low		
С	electrical conductivity	low	high		
D	melting point	high	low		

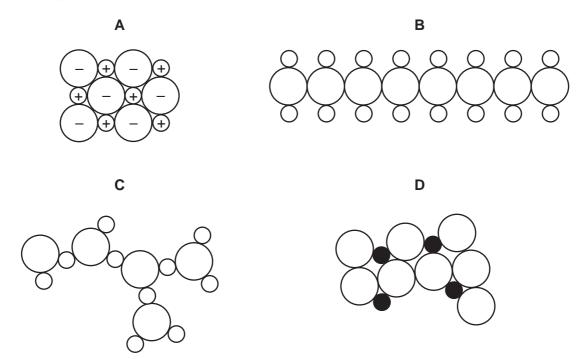
- 27 Which pollutant, found in car exhaust fumes, does not come from the fuel?
 - A carbon monoxide
 - **B** hydrocarbons
 - C lead compounds
 - **D** nitrogen oxides
- 28 The diagram shows the materials used in the production of steel from impure iron.



What could element X be?

- A calcium
- **B** carbon
- C nitrogen
- **D** sulfur
- 29 Which property do all metals have?
 - A Their boiling points are low.
 - **B** Their densities are low.
 - **C** They conduct electricity.
 - **D** They react with water.

30 Which diagram could represent the structure of an alloy?



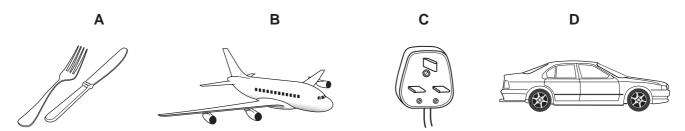
31 Some metals react readily with dilute hydrochloric acid.

Some metals can be extracted by heating their oxides with carbon.

For which metal are **both** statements correct?

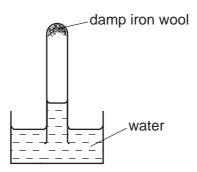
- A calcium
- **B** copper
- **C** iron
- **D** magnesium

32 Which diagram shows a common use of stainless steel?



- **33** Why is chlorination used in water treatment?
 - A to kill bacteria in the water
 - **B** to make the water neutral
 - **C** to make the water taste better
 - **D** to remove any salt in the water
- **34** A test-tube containing damp iron wool is inverted in water.

After three days, the water level inside the test-tube has risen.



Which statement explains this rise?

- A Iron oxide has been formed.
- **B** Iron wool has been reduced.
- **C** Oxygen has been formed.
- **D** The temperature of the water has risen.
- **35** A bag of fertiliser 'Watch it grow' contains ammonium sulfate and potassium sulfate.

Which of the three elements N, P and K does 'Watch it grow' contain?

	Ν	Р	K
Α	✓	✓	x
В	✓	x	✓
С	X	✓	X
D	X	X	✓

36 Which information about carbon dioxide and methane is correct?

		carbon dioxide	methane
Α	formed when vegetation decomposes	✓	x
В	greenhouse gas	✓	✓
С	present in unpolluted air	X	x
D	produced during respiration	X	✓

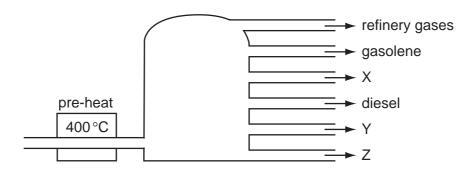
37 Ethene reacts with Y to produce ethanol.

ethene +
$$Y \rightarrow$$
 ethanol

What is Y?

- A hydrogen
- **B** oxygen
- C steam
- **D** yeast
- **38** In an oil refinery, crude oil is separated into useful fractions.

The diagram shows some of these fractions.



What are fractions X, Y and Z?

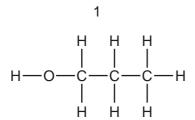
	Х	Y	Z	
Α	fuel oil	bitumen	paraffin (kerosene)	
В	fuel oil	fuel oil paraffin (kerosene)		
С	paraffin (kerosene)	bitumen	fuel oil	
D	paraffin (kerosene)	paraffin (kerosene) fuel oil		

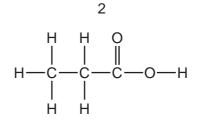
39 The diagram shows the structure of a compound.

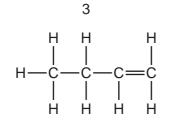
To which classes of compound does this molecule belong?

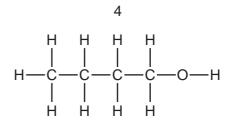
	alkane	alkene	alcohol
Α	no	no	no
В	no	yes	yes
С	yes	no	yes
D	yes	yes	yes

40 Which structures show compounds that are members of the same homologous series?









1 and 2

B 1 and 4 **C** 2 and 3

D 3 and 4

DATA SHEET
The Periodic Table of the Elements

	0	4 He Helium	Neon 10 Argon 18	84 Krypton 36	Xe Xenon 54	Rn Radon 86		175 Lu Lutetium 71	Lr Lawrencium 103
_	II/		19 Fluorine 9 35.5 C 1 Chlorine	80 Br Bromine 35	127 I lodine 53	At Astatine 85		Yb Ytterbium 70	Nobelium
	IN		16 Oxygen 8 32 \$ \$ \$ Suffur	Selenium	128 Te Tellurium 52	Po Polonium 84		169 Tm Thulium	Md Mendelevium 101
	>	<u>-</u>		75 AS Arsenic 33	Sb Antimony 51	209 Bi Bismuth 83		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	ES Einsteinium 99
	=			11 B Boron 5 A A Auminium 13	_	115 In Indium 49	204 T t Thallium		162 Dy Dysprosium 66
		'		65 Zn Zinc 30	Cadmium Cadua Cadmium 48	201 Hg Mercury 80		159 Tb Terbium 65	BK Berkelium
				64 Copper 29	108 Ag Silver 47	197 Au Gold		157 Gd Gadolinium 64	Curium 96
dno				Se Nickel 28	106 Pd Palladium 46	195 Pt Platinum 78		Europium 63	Am Americium 95
Group				59 Cob att 27	103 Rh Rhodium 45	192 I r Iridium		Sm Samarium 62	Pu Plutonium
		T Hydrogen		56 Fe Iron	Ruthenium 44	190 OS Osmium 76		Pm Promethium 61	Np Neptunium 93
				Mn Manganese 25	Tc Technetium 43	186 Re Rhenium 75		144 Ne Neodymium 60	238 U Uranium 92
				52 Cr Chromium 24	96 Mo Molybdenum 42	184 W Tungsten 74		141 Pr Praseodymium 59	Pa Protactinium 91
				51 Vanadium 23	93 Nb Niobium 41	181 Ta Tantalum 73		140 Ce Cerium	232 Th Thorium 90
				48 T tanium 22	91 Zr Zirconium 40	178 Hf Hafnium 72			nic mass ool nic) number
				45 Scandium 21	89 Y Yttrium 39	139 La Lanthanum *	227 Ac Actinium 89	series eries	 a = relative atomic mass X = atomic symbol b = proton (atomic) number
	=		Be Beryllium 4 24 Mg Magnesium 12	40 Ca Calcium 20	88 Sr Strontium 38	137 Ba Barium 56	226 Ra Radium 88	*58-71 Lanthanoid series 190-103 Actinoid series	a × a
	_		Lithium 3 23 Na Sodium 11	39 K Potassium 19	Rb Rubidium	133 Csesium 55	Fr Francium 87	*58-71 L _i	Key

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

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