UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CHEMISTRY **0620/12**

Paper 1 Multiple Choice **October/November 2012**

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 **15** printed pages and **1** blank page.

1 What are the processes W, X, Y and Z in the following diagram?

$$\text{solid} \underset{Y}{\overset{W}{\rightleftharpoons}} \text{liquid} \underset{Z}{\overset{X}{\rightleftharpoons}} \text{gas}$$

	W	X	Y	Z
A	condensing	boiling	freezing	melting
B	condensing	freezing	melting	boiling
C	melting	boiling	freezing	condensing
D	melting	freezing	condensing	boiling

2 Part of the instructions in an experiment reads as follows.

Quickly add 50 cm^3 of acid.

What is the best piece of apparatus to use?

A a burette

B a conical flask

C a measuring cylinder

D a pipette

3 A mixture of sulfur and iron filings needs to be separated. The solubilities of sulfur and iron filings in water and carbon disulfide are shown in the table below.

	solubility in water	solubility in carbon disulfide
sulfur	✗	✓
iron filings	✗	✗

What are possible methods of separating the sulfur and iron filings?

	using water	using carbon disulfide	using a magnet
A	✓	✓	✗
B	✗	✓	✓
C	✓	✗	✓
D	✗	✓	✗

4 Which row gives the number of electrons in the outer electron shell of fluorine and of neon?

	$^{19}_{9}F$	$^{20}_{10}Ne$
A	7	8
B	7	10
C	9	8
D	9	10

5 Which statements comparing the properties of electrons, neutrons and protons are correct?

	neutrons and protons are both heavier than electrons	only electrons and neutrons are charged
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

6 The table shows the electronic structures of four atoms.

atom	electronic structure
W	2,1
X	2,7
Y	2,8,4
Z	2,8,8

Which two atoms combine to form an ionic compound?

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

7 In the molecules CH_4, HCl and H_2O, which atoms use **all** of their outer shell electrons in bonding?

A C and Cl **B** C and H **C** Cl and H **D** H and O

8 A compound has the formula CH_3CO_2H.

How should the relative molecular mass, M_r, of this compound be calculated?

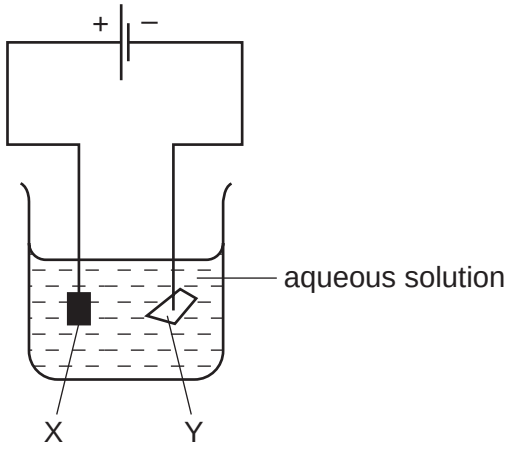
A 12 + 1 + 16

B 3(12 + 1) + 2(12 + 16) + 1

C (4 × 12) + (2 × 1) + 16

D (2 × 12) + (4 × 1) + (2 × 16)

9 The diagram shows an electrolysis experiment using metals X and Y as electrodes.

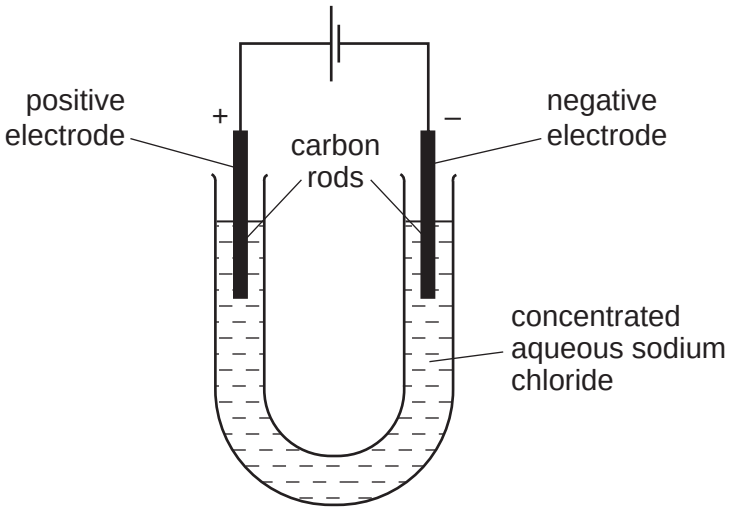


One of the metals becomes coated with copper.

Which metal becomes coated and which aqueous solution is used?

	metal	aqueous solution
A	X	$CrCl_3$
B	X	$CuCl_2$
C	Y	$CrCl_3$
D	Y	$CuCl_2$

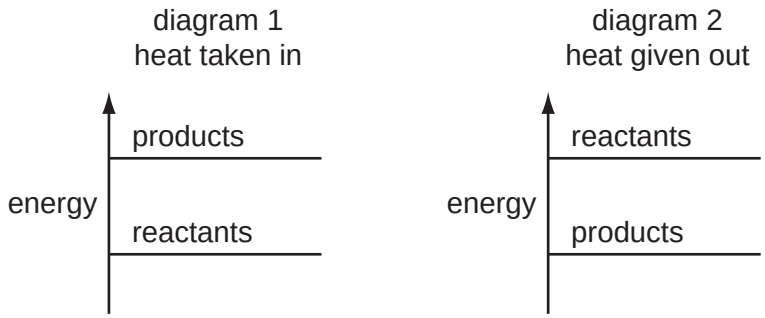
10 The diagram shows the electrolysis of concentrated aqueous sodium chloride.



What is produced at each of the electrodes?

	product at cathode	product at anode
A	hydrogen	chlorine
B	hydrogen	oxygen
C	sodium	chlorine
D	sodium	oxygen

11 The diagrams show the difference in energies of the reactants and products in two types of reaction.



Which diagram and which type of energy change apply to a fuel burning in air?

	diagram	type of energy change
A	1	endothermic
B	1	exothermic
C	2	endothermic
D	2	exothermic

12 Which change is an oxidation?

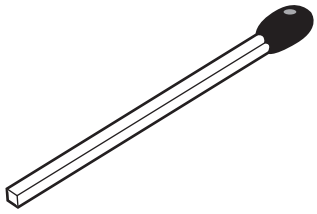
A FeO to Fe_2O_3

B Fe_2O_3 to FeO

C H_2O_2 to H_2O

D H_2O to H_2

13 The diagram shows a match.



By striking the match, a chemical reaction takes place.

Which statements about the chemical reaction are correct?

	type of reaction	reason
A	endothermic	because energy is used to strike the match
B	endothermic	because energy is given out as the match burns
C	exothermic	because energy is used to strike the match
D	exothermic	because energy is given out as the match burns

14 Separate samples of anhydrous and hydrated copper(II) sulfate are heated.

Which shows the correct colour changes?

	anhydrous copper(II) sulfate	hydrated copper(II) sulfate
A	blue to white	white to blue
B	no change	blue to white
C	white to blue	blue to white
D	white to blue	no change

15 Element X forms an acidic, covalent oxide.

Which row shows how many electrons there could be in the outer shell of an atom of X?

	1	2	6	7
A	✓	✓	✗	✗
B	✓	✗	✓	✗
C	✗	✗	✓	✓
D	✗	✓	✗	✓

16 Which change does **not** increase the speed of reaction between zinc and hydrochloric acid?

A adding a catalyst

B decreasing the particle size of the zinc

C decreasing the temperature

D using more concentrated acid

17 Barium hydroxide is an alkali. It reacts with hydrochloric acid.

How does the pH of the hydrochloric acid change as an excess of aqueous barium hydroxide is added?

A The pH decreases from 14 and becomes constant at 7.

B The pH decreases from 14 to about 1.

C The pH increases from 1 and becomes constant at 7.

D The pH increases from 1 to about 14.

18 Which of these pairs of aqueous ions **both** react with dilute sulfuric acid to give a visible result?

A Ba^{2+} and Cl^{-}

B Ba^{2+} and CO_3^{2-}

C NH_4^{+} and Cl^{-}

D NH_4^{+} and CO_3^{2-}

19 A compound is a salt if it

A can neutralise an acid.

B contains more than one element.

C dissolves in water.

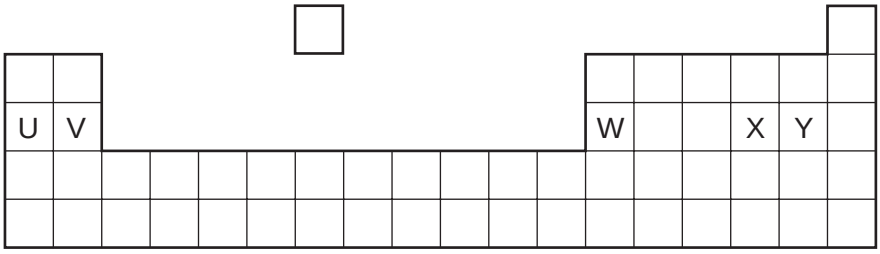
D is formed when an acid reacts with a base.

20 The table gives information about four elements.

Which element is a transition metal?

	colour of element	electrical conductivity of element	colour of oxide
A	black	high	colourless
B	colourless	low	white
C	grey	high	red
D	yellow	low	colourless

21 The diagram shows an outline of the Periodic Table.



Which of the elements U, V, W, X and Y would react together in the ratio of 1 : 1?

A U and X **B** U and Y **C** V and Y **D** W and X

22 The element rubidium, Rb, is immediately below potassium in the Periodic Table.

It reacts with bromine to form the compound rubidium bromide.

Which descriptions of this compound are correct?

	type of bond	formula	colour
A	covalent	RbBr	brown
B	covalent	$RbBr_2$	white
C	ionic	RbBr	white
D	ionic	$RbBr_2$	brown

23 Brass is used in electrical equipment.

It contains two ……1…… elements. Together they form ……2…… .

Which words correctly complete gaps 1 and 2?

	1	2
A	metallic	a covalent compound
B	metallic	an alloy
C	non-metallic	a covalent compound
D	non-metallic	an alloy

24 Why are weather balloons filled with helium rather than hydrogen?

A Helium is found in air.

B Helium is less dense than hydrogen.

C Helium is more dense than hydrogen.

D Helium is unreactive.

25 Some properties of aluminium are listed.

1 It has mechanical strength.

2 It conducts heat.

3 It is resistant to corrosion.

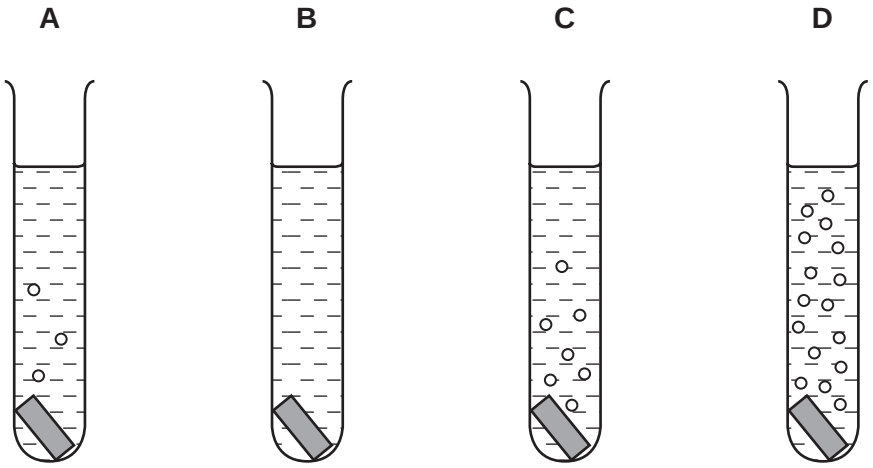
4 It has a low density.

Which properties make aluminium useful for making the bodies of aircraft?

A 1, 2 and 3 **B** 1, 2 and 4 **C** 1, 3 and 4 **D** 2, 3 and 4

26 Pieces of copper, iron, magnesium and zinc are added to separate test-tubes containing dilute hydrochloric acid.

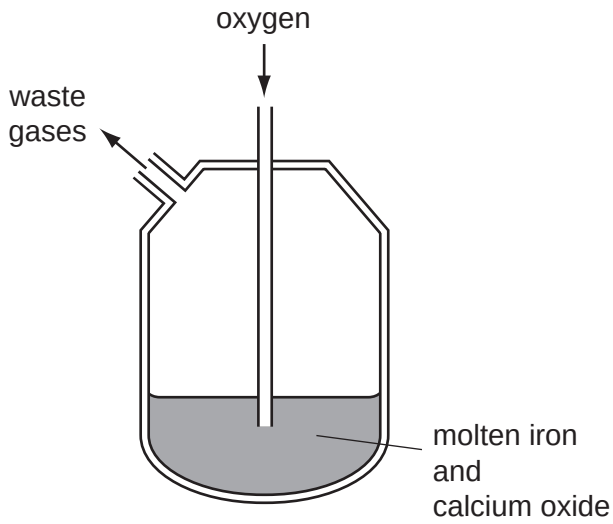
Which test-tube contains iron and dilute hydrochloric acid?



27 The Basic Oxygen Process converts iron into steel.

In step 1, oxygen is blown into impure molten iron.

In step 2, oxides are removed by reaction with calcium oxide.



Which chemical reaction takes place in step 1 and which type of oxides are removed in step 2?

	chemical reaction in step 1	type of oxides removed in step 2
A	carbon is converted to carbon dioxide	acidic
B	carbon is converted to carbon dioxide	basic
C	iron is converted to iron(III) oxide	acidic
D	iron is converted to iron(III) oxide	basic

28 What is the correct order of abundance of the gases in the air?

A nitrogen → oxygen → argon → carbon dioxide

B nitrogen → oxygen → carbon dioxide → argon

C oxygen → nitrogen → argon → carbon dioxide

D oxygen → nitrogen → carbon dioxide → argon

29 Which processes are used in the treatment of water?

A filtration and chlorination

B filtration and reduction

C neutralisation and chlorination

D neutralisation and reduction

30 A factory burns coal with a high sulfur content.

Which pollutant is **most** likely to lead to the death of trees?

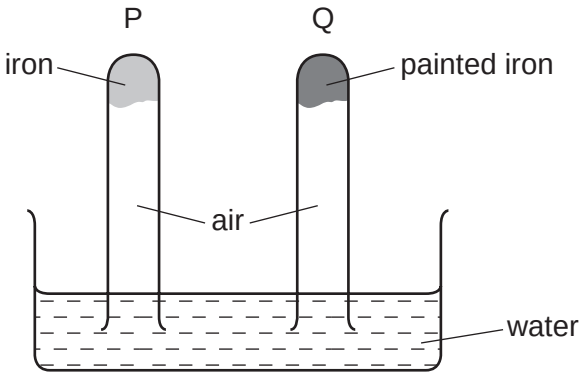
A carbon dioxide

B carbon monoxide

C lead compounds

D sulfur dioxide

31 The diagram shows an experiment to investigate how paint affects the rusting of iron.



What happens to the water level in tubes P and Q?

	tube P	tube Q
A	falls	rises
B	no change	rises
C	rises	falls
D	rises	no change

32 Carbon dioxide is produced when dilute hydrochloric acid reacts with

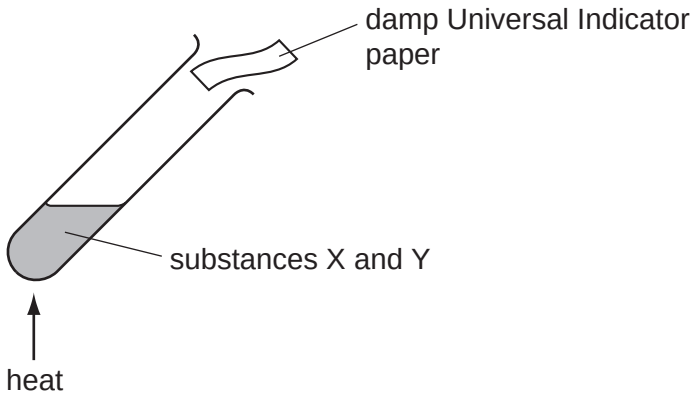
A calcium sulfate.

B carbon.

C copper(II) carbonate.

D limewater.

33 The diagram shows two substances, X and Y, being heated together.



The Universal Indicator paper turns blue during the experiment.

What are substances X and Y?

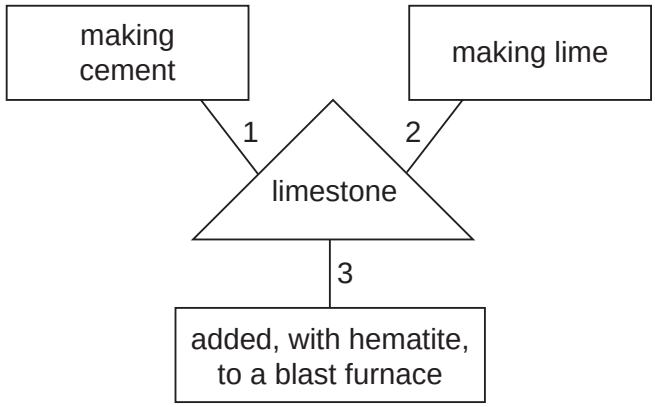
A ammonium nitrate and hydrochloric acid

B ammonium nitrate and sodium hydroxide

C sodium carbonate and hydrochloric acid

D sodium carbonate and sodium hydroxide

34 A student is asked to draw a diagram showing the uses of limestone.



Which numbered lines show a correct use of limestone?

A 1 and 2 only

B 1 and 3 only

C 2 and 3 only

D 1, 2 and 3

35 Which properties of the different compounds in petroleum enable its separation into fractions?

1 boiling point

2 chain length

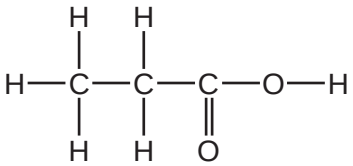
3 chemical reactivity

4 solubility in water

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

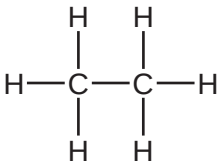
36 Which structure is correctly named?

A



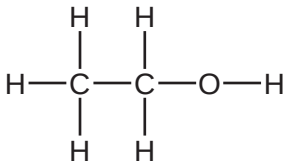
ethanoic acid

B



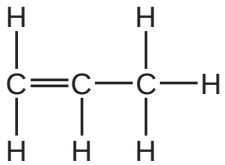
ethene

C



ethanol

D



propane

37 Alkenes have the general formula C_nH_{2n}.

Which of the following is an alkene?

A CH_2 **B** CH_4 **C** C_3H_6 **D** C_6H_6

38 A hydrocarbon X is cracked to make Y and hydrogen.

Compound Z is formed by the addition polymerisation of Y.

To which homologous series do X, Y and Z belong?

	alkane	alkene
A	X, Y and Z	–
B	X and Y	Z
C	X and Z	Y
D	Y and Z	X

39 Bitumen is a substance obtained from the fractional distillation of petroleum.

Which row describes its boiling point and the size of its molecules?

	boiling point	size of molecules
A	high	large
B	high	small
C	low	large
D	low	small

40 Which row is correct for ethanol?

	burns	made by fermentation
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

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DATA SHEET
The Periodic Table of the Elements

Group																		
I	II										III	IV	V	VI	VII	0
																4 **He** Helium 2
					1 **H** Hydrogen 1											
7 **Li** Lithium 3	9 **Be** Beryllium 4										11 **B** Boron 5	12 **C** Carbon 6	14 **N** Nitrogen 7	16 **O** Oxygen 8	19 **F** Fluorine 9	20 **Ne** Neon 10
23 **Na** Sodium 11	24 **Mg** Magnesium 12										27 **Al** Aluminium 13	28 **Si** Silicon 14	31 **P** Phosphorus 15	32 **S** Sulfur 16	35.5 **Cl** Chlorine 17	40 **Ar** Argon 18
39 **K** Potassium 19	40 **Ca** Calcium 20	45 **Sc** Scandium 21	48 **Ti** Titanium 22	51 **V** Vanadium 23	52 **Cr** Chromium 24	55 **Mn** Manganese 25	56 **Fe** Iron 26	59 **Co** Cobalt 27	59 **Ni** Nickel 28	64 **Cu** Copper 29	65 **Zn** Zinc 30	70 **Ga** Gallium 31	73 **Ge** Germanium 32	75 **As** Arsenic 33	79 **Se** Selenium 34	80 **Br** Bromine 35	84 **Kr** Krypton 36
85 **Rb** Rubidium 37	88 **Sr** Strontium 38	89 **Y** Yttrium 39	91 **Zr** Zirconium 40	93 **Nb** Niobium 41	96 **Mo** Molybdenum 42	**Tc** Technetium 43	101 **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 50	122 **Sb** Antimony 51	128 **Te** Tellurium 52	127 **I** Iodine 53	131 **Xe** Xenon 54
133 **Cs** Caesium 55	137 **Ba** Barium 56	139 **La** Lanthanum 57 *	178 **Hf** Hafnium 72	181 **Ta** Tantalum 73	184 **W** Tungsten 74	186 **Re** Rhenium 75	190 **Os** Osmium 76	192 **Ir** Iridium 77	195 **Pt** Platinum 78	197 **Au** Gold 79	201 **Hg** Mercury 80	204 **Tl** Thallium 81	207 **Pb** Lead 82	209 **Bi** Bismuth 83	**Po** Polonium 84	**At** Astatine 85	**Rn** Radon 86
Fr Francium 87	226 **Ra** Radium 88	227 **Ac** Actinium 89 †															

140 **Ce** Cerium 58	141 **Pr** Praseodymium 59	144 **Nd** Neodymium 60	**Pm** Promethium 61	150 **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	175 **Lu** Lutetium 71
232 **Th** Thorium 90	**Pa** Protactinium 91	238 **U** Uranium 92	**Np** Neptunium 93	**Pu** Plutonium 94	**Am** Americium 95	**Cm** Curium 96	**Bk** Berkelium 97	**Cf** Californium 98	**Es** Einsteinium 99	**Fm** Fermium 100	**Md** Mendelevium 101	**No** Nobelium 102	**Lr** Lawrencium 103

*58-71 Lanthanoid series
†90-103 Actinoid series

Key

a	a = relative atomic mass
X	X = atomic symbol
b	b = proton (atomic) number

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).