UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CHEMISTRY **0620/13**

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 **14** printed pages and **2** blank pages.

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1 ‘Particles moving **very slowly** from an area of high concentration to an area of low concentration.’

Which process is being described above?

A a liquid being frozen

B a solid melting

C a substance diffusing through a liquid

D a substance diffusing through the air

2 Solid W melts at exactly 54 °C and boils at exactly 302 °C.

Solid X, when dissolved in water and examined using paper chromatography, shows a blue colour and a red colour.

Which row is correct?

	contains only one substance	contains more than one substance
A	W and X	–
B	W	X
C	X	W
D	–	W and X

3 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

4 The nucleon number of an isotope of rubidium is 85.

How many protons, neutrons and electrons are present in an atom of this isotope?

	protons	neutrons	electrons
A	37	48	37
B	37	48	39
C	39	46	37
D	39	46	39

5 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

6 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

7 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

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 In separate experiments, electricity was passed through concentrated aqueous sodium chloride and molten lead bromide.

What would happen in **both** experiments?

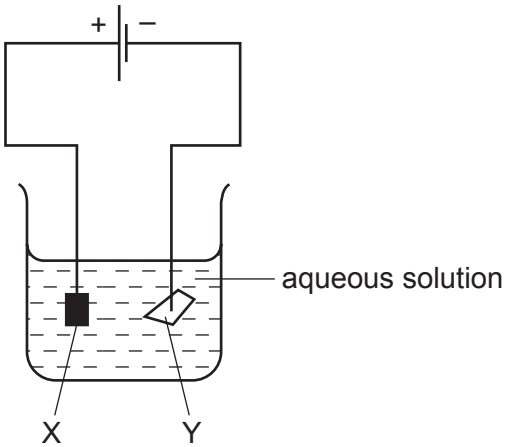
A A halogen would be formed at the anode.

B A metal would be formed at the cathode.

C Hydrogen would be formed at the anode.

D Hydrogen would be formed at the cathode.

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

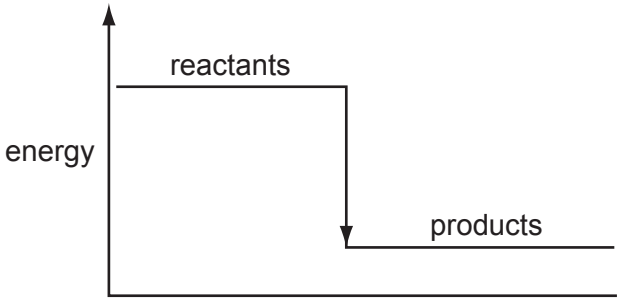


One of the metals becomes coated with copper.

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	$CuCl_2$

11 A diagram for the energy change during an exothermic reaction is shown.



For which reactions would this be an appropriate diagram?

1 $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

2 $2H_2 + O_2 \rightarrow 2H_2O$

3 $C + O_2 \rightarrow CO_2$

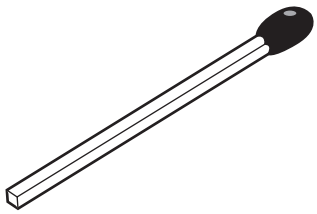
A none of them

B 1 and 2 only

C 2 and 3 only

D all of them

12 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

13 Solid copper(II) sulfate can exist in two different forms, anhydrous and hydrated.

One of these forms is blue and the other is white.

The change between these two forms is reversible.

$$\text{blue form} \rightleftharpoons \text{white form}$$

Which is the blue form and how is the change from the blue form to the white form brought about?

	blue form	change to white form
A	anhydrous	add water
B	anhydrous	heat
C	hydrated	add water
D	hydrated	heat

14 Which statement describes what happens in the reaction shown?

$$2Mg + CO_2 \rightarrow 2MgO + C$$

A Carbon and magnesium are both oxidised.

B Carbon is oxidised and magnesium oxide is reduced.

C Magnesium is oxidised and carbon dioxide is reduced.

D Magnesium oxide and carbon dioxide are both reduced.

15 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

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16 Salts X and Y are separately dissolved in water.

Samples of the solutions obtained are separately tested with dilute hydrochloric acid and with aqueous sodium hydroxide.

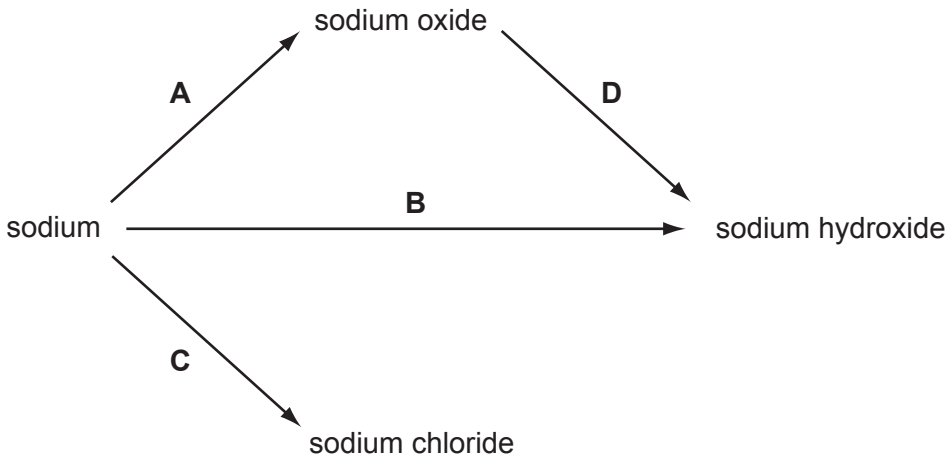
In two of the tests, a gaseous product is formed. No precipitate is formed in any of the tests.

What are salts X and Y?

	X	Y
A	$AgNO_3$	$BaSO_4$
B	$BaSO_4$	Na_2CO_3
C	Na_2CO_3	NH_4Cl
D	NH_4Cl	$AgNO_3$

17 Some reactions involving sodium are shown.

Which reaction does **not** involve the formation of a base?



18 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.

19 A compound is a salt if it

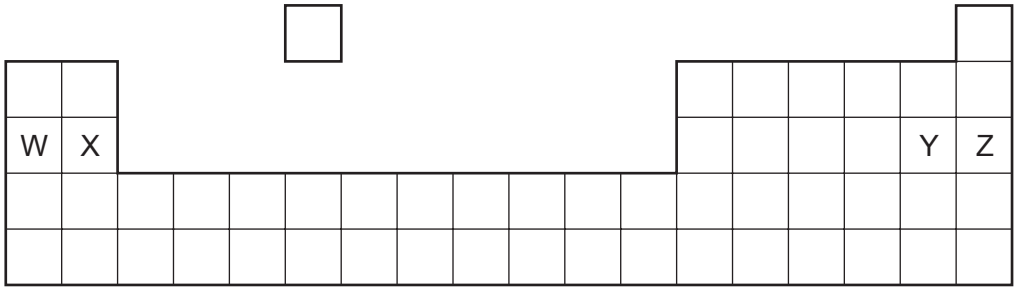
A can neutralise an acid.

B contains more than one element.

C dissolves in water.

D is formed when an acid reacts with a base.

20 The diagram shows an outline of the Periodic Table.



Which ionic compound could be formed?

A W^+Y^- **B** W^+Z^- **C** X^+Y^- **D** X^+Z^-

21 Element X is in Group VII of the Periodic Table.

It reacts with aqueous potassium bromide as shown.

$$X_2 + 2KBr \rightarrow 2KX + Br_2$$

Which statements about X are correct?

	relative atomic mass	reactivity
A	greater than that of bromine	less reactive than bromine
B	greater than that of bromine	more reactive than bromine
C	less than that of bromine	less reactive than bromine
D	less than that of bromine	more reactive than bromine

22 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

23 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.

24 The three statements below about aluminium are all correct.

1 Aluminium has an oxide ore.

2 Aluminium is extracted from its ore by electrolysis.

3 Aluminium is used to make cooking utensils.

In which of these statements can '**aluminium**' be replaced by '**iron**' and still be correct?

	1	2	3
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✓

25 Statement 1: An aluminium alloy containing a small amount of copper is stronger than pure aluminium.

Statement 2: Alloys are made by mixing molten metals together and allowing them to cool.

Which of the following is true?

A Both statements are correct and statement 2 explains statement 1.

B Both statements are correct but statement 2 does not explain statement 1.

C Statement 1 is correct but statement 2 is not correct.

D Statement 2 is correct but statement 1 is not correct.

26 Iron is extracted from its ore in a Blast Furnace.

Hematite, coke, limestone and hot air are added to the furnace.

Which explanation is **not** correct?

A Coke burns and produces a high temperature.

B Hematite is the ore containing the iron as iron oxide.

C Hot air provides the oxygen for the burning.

D Limestone reduces the iron oxide to iron.

27 How does the reactivity of potassium compare with that of sodium and how does the reactivity of calcium compare with that of magnesium?

	reactivity of potassium and sodium	reactivity of calcium and magnesium
A	K greater than Na	Ca greater than Mg
B	K greater than Na	Mg greater than Ca
C	Na greater than K	Ca greater than Mg
D	Na greater than K	Mg greater than Ca

28 Untreated water can spread diseases such as cholera.

What can be added to drinking water to reduce the spread of such diseases?

A carbon monoxide

B chlorine

C nitrogen monoxide

D sulfur

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29 Statement 1: The burning of fossil fuels containing sulfur is a cause of 'acid rain'.

Statement 2: Acid rain contains sulfur dioxide which is formed when sulfur compounds burn in the air.

Which of the following is true?

A Both statements are correct and statement 2 explains statement 1.

B Both statements are correct, but statement 2 does not explain statement 1.

C Statement 1 is correct but statement 2 is incorrect.

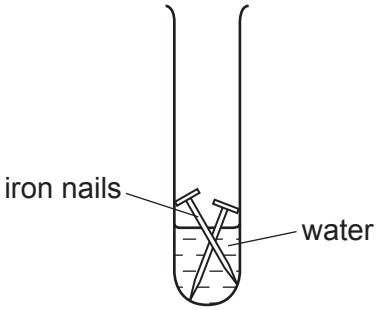
D Statement 2 is correct but statement 1 is incorrect.

30 Argon is a noble gas used to fill light bulbs.

What is the approximate percentage of argon in air?

A 1 % **B** 20 % **C** 79 % **D** 99 %

31 The experiment shown was set up to investigate the rusting of iron.



Rusting occurs in this experiment because of the presence of

A hydrogen and oxygen.

B nitrogen and oxygen.

C nitrogen and water.

D oxygen and water.

32 What are X and Y in the reaction shown?

ammonium chloride + solution X $\rightarrow$ alkaline gas Y

	X	Y
A	hydrochloric acid	ammonia
B	hydrochloric acid	chlorine
C	sodium hydroxide	ammonia
D	sodium hydroxide	chlorine

33 Which process does **not** produce carbon dioxide?

A combustion of petrol

B reaction between an acid and a metal hydroxide

C reaction between an acid and a carbonate

D respiration

34 Two industrial processes that involve heating are

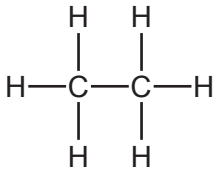
- extracting iron from its ore using a blast furnace,
- making lime.

In which of these processes is calcium carbonate used?

	extracting iron	making lime
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

35 Which structure shows a carboxylic acid?

A



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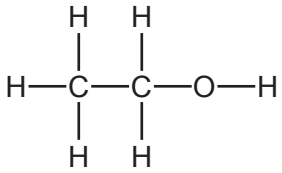
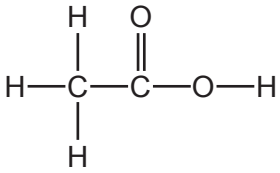
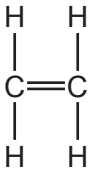


C



D



36 Which method is used to obtain petrol from petroleum?

A crystallisation

B diffusion

C filtration

D fractional distillation

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37 Which group of compounds is part of a homologous series?

A CH_4, C_2H_4, C_3H_8

B C_3H_6, C_3H_8, C_3H_7OH

C CH_3OH, C_2H_5OH, C_3H_7OH

D CH_3CO_2H, CH_3CH_2OH, HCO_2H

38 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

39 A hydrocarbon A is cracked to make B and hydrogen.

Compound C is formed by the addition polymerisation of B.

To which homologous series do A, B and C belong?

	alkene	alkane
A	A	B and C
B	B	A and C
C	C	A and B
D	–	A and C

40 Which statement about ethanol is **not** correct?

A It can be used as a fuel.

B It can be used as a solvent.

C It is formed by reaction between steam and ethane.

D Its functional group is –OH.

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DATA SHEET
The Periodic Table of the Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 0
							1 **H** Hydrogen 1										4 **He** Helium 2
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
X
b

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

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

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