UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CHEMISTRY **5070/12**

Paper 1 Multiple Choice **May/June 2013**

1 hour

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

* 6 4 5 0 5 9 8 4 9 3 *

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 16.
Electronic calculators may be used.

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

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1 Which mixture could best be separated by using a separating funnel?

A oil and sand

B oil and water

C sodium chloride and sand

D sodium chloride and water

2 Which process involves boiling a liquid and condensing the vapour?

A crystallisation

B distillation

C evaporation

D filtration

3 Which compound, when mixed with aqueous barium nitrate, does **not** form a white precipitate?

A ammonium carbonate

B dilute sulfuric acid

C silver nitrate

D sodium carbonate

4 The structure of metals consists of positive ions in a 'sea of electrons'.

Which statement correctly describes what happens to the particles in the metallic heating element of an electric kettle when the kettle is switched on?

A Electrons move in both directions in the element.

B Electrons move in one direction only in the element.

C Electrons move in one direction and positive ions move in the opposite direction in the element.

D Positive ions move in one direction only in the element.

5 Naturally-occurring bromine has a relative atomic mass of 80 and consists entirely of two isotopes of relative atomic masses 79 and 81.

What can be deduced about naturally-occurring bromine from this information only?

A Bromine contains the two isotopes in equal proportions.

B Bromine has different oxidation states.

C Bromine isotopes have different numbers of protons.

D Bromine is radioactive.

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6 Silicon carbide, SiC, has a structure similar to diamond. Boron nitride, BN, has a structure similar to graphite. Bronze is an alloy of copper and tin.

Which statements about SiC, BN and bronze are correct?

1 All are bonded covalently.

2 All except silicon carbide conduct electricity when solid.

3 All have high melting points.

A 1 and 2 only

B 1 and 3 only

C 2 and 3 only

D 1, 2 and 3

7 What can be deduced about two gases that have the same relative molecular mass?

A They have the same boiling point.

B They have the same number of atoms in one molecule.

C They have the same rate of diffusion at room temperature and pressure.

D They have the same solubility in water at room temperature.

8 Sodium is in Group I of the Periodic Table.

When sodium combines with chlorine, what happens to each sodium atom?

A It gains one electron from one chlorine atom.

B It shares one electron with one chlorine atom.

C It transfers one electron to one chlorine atom.

D It transfers two electrons to one chlorine atom.

9 Hydrogen and sulfur react to form the compound hydrogen sulfide.

Which row shows the type of bonding between hydrogen and sulfur and the electrical conductivity of liquid hydrogen sulfide?

	type of bonding	electrical conductivity in the liquid state
A	covalent	good
B	covalent	non-conductor
C	ionic	good
D	ionic	non-conductor

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10 Which statement about aqueous potassium sulfate is correct?

A It contains more sulfate ions than potassium ions.

B It contains two different types of molecule.

C It does not conduct electricity.

D It forms a white precipitate when added to aqueous barium nitrate.

11 One volume of a gaseous element X_2 combines with an equal volume of gaseous hydrogen to form two volumes of a gaseous hydride.

What is the formula for the hydride of X?

A H_2X **B** HX **C** HX_2 **D** H_2X_2

12 The relative atomic mass of chlorine is 35.5.

What is the mass of 2 moles of chlorine gas?

A 17.75 g **B** 35.5 g **C** 71 g **D** 142 g

13 How could a sample of potassium be obtained from potassium chloride, KCl?

method 1 adding zinc to a solution of KCl

method 2 electrolysing an aqueous solution of KCl

method 3 electrolysing molten KCl

A method 1 only

B methods 1 and 2

C methods 2 and 3

D method 3 only

14 A concentrated aqueous solution of copper(II) chloride is electrolysed using inert electrodes.

What is the product at the positive electrode?

A chlorine

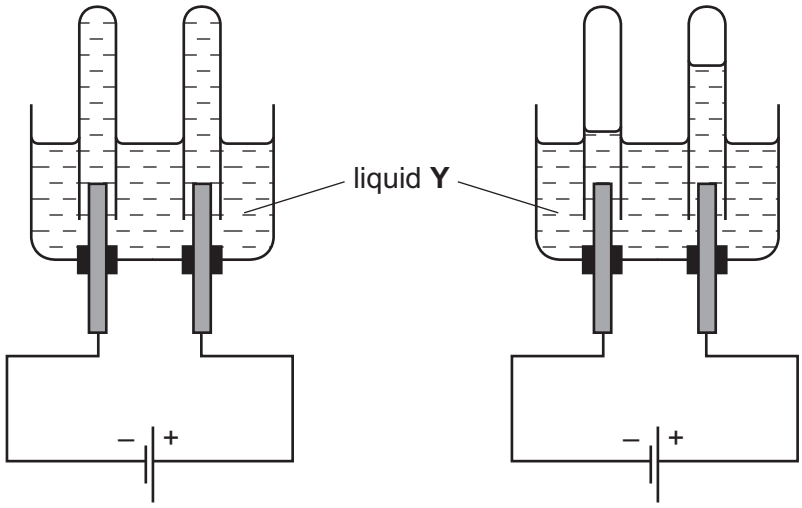
B copper

C hydrogen

D oxygen

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15 The diagrams show an electrolysis experiment using inert electrodes.



before electrolysis　　after electrolysis

Which could be liquid **Y**?

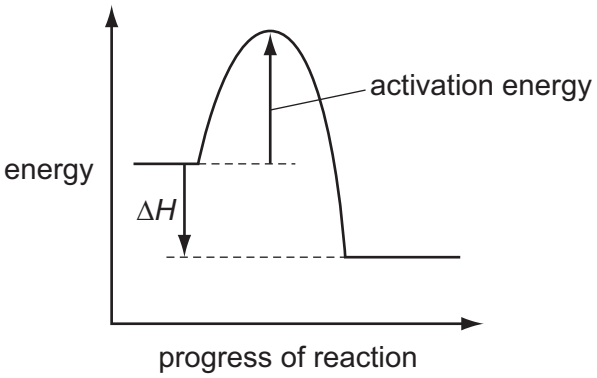
A aqueous copper(II) sulfate

B concentrated aqueous sodium chloride

C dilute sulfuric acid

D ethanol

16 The energy profile for the forward direction of a reversible reaction is shown.



Which row correctly shows both the sign of the activation energy and the type of the enthalpy change for the **reverse** reaction?

	sign of activation energy	enthalpy change
A	negative	endothermic
B	negative	exothermic
C	positive	endothermic
D	positive	exothermic

17 Which ionic equation describes a redox reaction?

A $Ag^+(aq) + Cl^-(aq) \rightarrow AgCl(s)$

B $2H^+(aq) + CO_3^{2-}(aq) \rightarrow CO_2(g) + H_2O(l)$

C $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$

D $Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$

18 Four separate mixtures of a solution and a solid are made, as given in the table.

The mixtures are warmed.

In which mixtures does gas form?

	$NaOH(aq)$ and $NH_4Cl(s)$	$NaOH(aq)$ and $Mg(s)$	$H_2SO_4(aq)$ and $NH_4Cl(s)$	$H_2SO_4(aq)$ and $Mg(s)$
A	✓	✗	✓	✗
B	✓	✗	✗	✓
C	✗	✓	✓	✗
D	✗	✓	✗	✓

key

✓ = gas forms

✗ = no gas forms

19 Four oxides are added separately to aqueous sodium hydroxide.

1 aluminium oxide

2 carbon dioxide

3 copper(II) oxide

4 magnesium oxide

Which oxides react with aqueous sodium hydroxide?

A 1 and 2 only

B 1, 3 and 4 only

C 2 only

D 3 and 4 only

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20 Chlorine can be manufactured by the following reaction.

$$4HCl(g) + O_2(g) \rightleftharpoons 2H_2O(g) + 2Cl_2(g) \qquad \Delta H \text{ is negative}$$

A mixture in dynamic equilibrium is formed.

Which change to the mixture will increase the amount of chlorine at equilibrium?

A adding a catalyst

B adding more $HCl(g)$

C decreasing the pressure

D increasing the temperature

21 Which is a use of sulfuric acid?

A as a bleach

B in the manufacture of ammonia

C in the manufacture of fertilisers

D in the manufacture of sulfur trioxide

22 Which statement about ammonia is correct?

A It is a colourless, odourless gas.

B It is a gas which turns damp blue litmus paper red.

C It is formed when potassium nitrate is heated with aqueous sodium hydroxide and aluminium.

D It is manufactured using vanadium(V) oxide as a catalyst.

23 Which property is common to calcium, potassium and sodium?

A Their atoms all have more neutrons than protons.

B Their ions all have eight electrons in their outer shell.

C They all sink when added to water.

D They are all deposited at the positive electrode when their molten chloride is electrolysed.

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24 The table shows the solubility of some compounds of metal *Q* in cold water.

salt	solubility in cold water
carbonate	insoluble
chloride	soluble
sulfate	insoluble

What is metal *Q*?

A barium

B lead

C magnesium

D sodium

25 Which two statements indicate that metal *M* may have a proton number between 21 and 30?

1 It conducts electricity.

2 It does not react with water.

3 It forms two basic oxides with formulae *M*O and M_2O_3.

4 It forms two coloured sulfates.

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

26 An atom of which element has the same electronic configuration as the strontium ion?

A calcium

B krypton

C rubidium

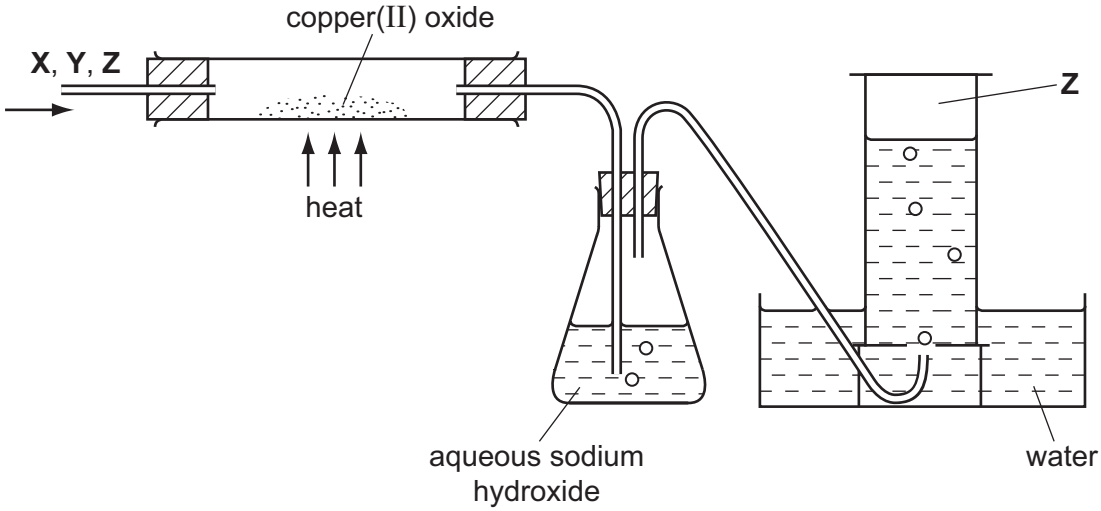
D selenium

27 Which substance, in the given physical state, is found at the bottom of the blast furnace?

	substance	physical state
A	calcium carbonate	solid
B	calcium silicate	liquid
C	carbon	liquid
D	iron	solid

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28 Gas **Z** is to be separated from a mixture of gases **X**, **Y** and **Z** by the apparatus shown in the diagram.



For which mixture will this system work successfully?

	X	Y	Z
A	hydrogen	carbon dioxide	nitrogen
B	oxygen	hydrogen	carbon monoxide
C	nitrogen	oxygen	hydrogen
D	carbon dioxide	nitrogen	oxygen

29 Magnesium can be obtained by heating magnesium oxide with which element?

A carbon

B hydrogen

C sodium

D zinc

30 Methanol is manufactured using the following reaction.

$$CO(g) + 2H_2(g) \rightleftharpoons CH_3OH(g)$$

The usual conditions are 30 atmospheres and 300 °C.

At 400 °C the percentage of methanol in the equilibrium mixture is lower than at 300 °C.

What could be the explanation for this?

A All the molecules are gaseous.

B The forward reaction is exothermic.

C The reaction is slower at 400 °C.

D There are fewer product molecules than reactant molecules.

31 In the electrolysis of molten aluminium oxide for the extraction of aluminium, the following three reactions take place.

1 $Al^{3+} + 3e^- \rightarrow Al$

2 $2O^{2-} \rightarrow O_2 + 4e^-$

3 $C + O_2 \rightarrow CO_2$

Which reactions take place at the positive electrode?

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

32 An alloy of copper and zinc is added to an excess of dilute hydrochloric acid. The resulting mixture is then filtered.

Which observations are correct?

	filtrate	residue
A	colourless solution	none
B	colourless solution	red-brown
C	blue solution	grey
D	blue solution	none

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33 The compounds $CO(NH_2)_2$ and NH_4NO_3 are used as fertilisers.

The proportion of nitrogen by mass in $CO(NH_2)_2$ is ……1…… that in NH_4NO_3.

The proportion of nitrogen by mole in $CO(NH_2)_2$ is ……2…… that in NH_4NO_3.

Which words correctly complete gaps 1 and 2?

	1	2
A	equal to	equal to
B	higher than	equal to
C	higher than	higher than
D	lower than	lower than

34 Which method will remove salt from seawater?

A chlorination

B distillation

C filtration

D use of carbon

35 Which organic compound requires the least oxygen for the complete combustion of one mole of the compound?

A C_3H_7OH **B** C_3H_7COOH **C** C_3H_8 **D** C_4H_8

36 Which polymer contains only three elements?

A protein

B poly(ethene)

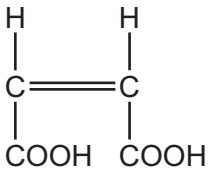
C poly(propene)

D starch

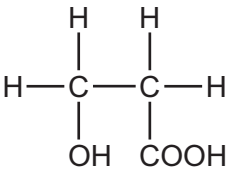
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37 What are the reactions of compounds W, X, Y and Z?

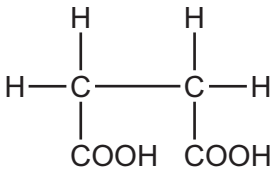
W



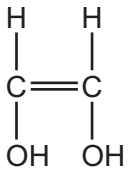
X



Y

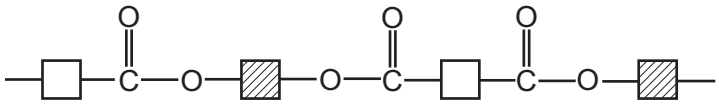


Z



	decolourises aqueous bromine	has a pH of less than 7	reacts with a carboxylic acid to form an ester
A	X and Y	W, X and Y	W, X , Y and Z
B	X and Y	X and Z	X and Z
C	W and Z	W, X and Y	X and Z
D	W and Z	X and Z	W, X and Y

38 The diagram shows the partial structure of *Terylene*.



From which pair of compounds is it made?

A



B



C



D



39 Which straight chain hydrocarbon can form a polymer by addition polymerisation?

A C_6H_{14} **B** C_7H_{14} **C** C_8H_{18} **D** C_9H_{20}

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40 Which information is correct regarding the formation of ethanol by the process of fermentation?

	substances fermented	gas evolved during fermentation
A	carbohydrates	carbon dioxide
B	carbohydrates	carbon monoxide
C	hydrocarbons	carbon dioxide
D	hydrocarbons	carbon monoxide

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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 = 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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