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)

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.

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UNIVERSITY of CAMBRIDGE International Examinations

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.

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

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?

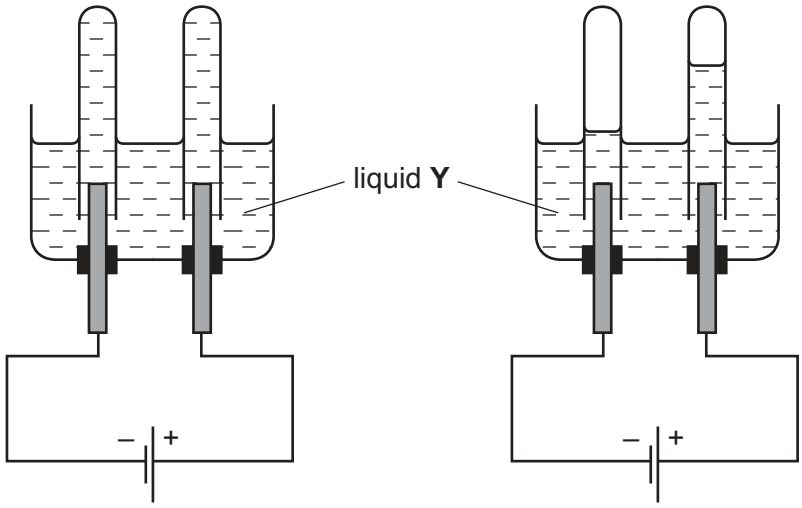
A chlorine

B copper

C hydrogen

D oxygen

15 The diagrams show an electrolysis experiment using inert electrodes.



before electrolysis　　after electrolysis

Which could be liquid **Y**?

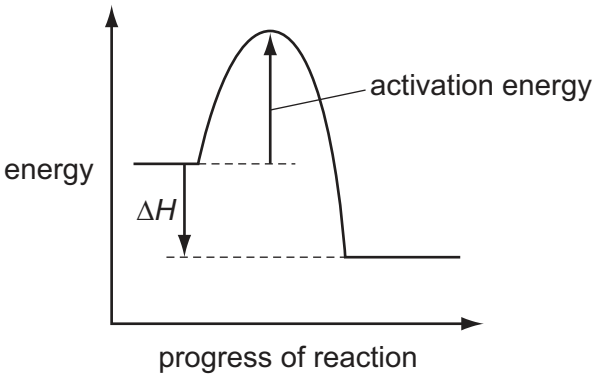
A aqueous copper(II) sulfate

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

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.

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

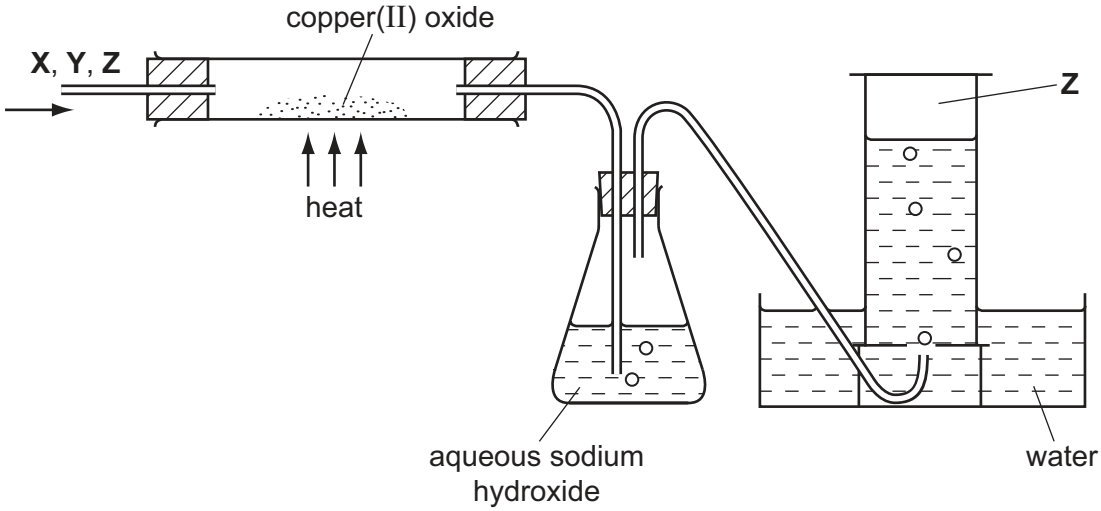
C rubidium

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

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

[Turn over

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

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

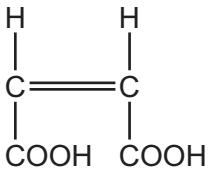
B poly(ethene)

C poly(propene)

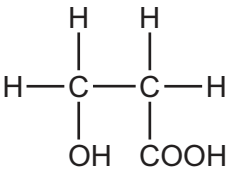
D starch

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

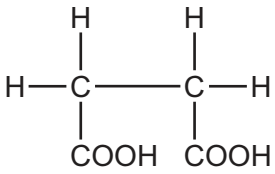
W



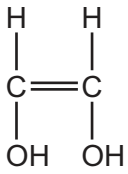
X



Y

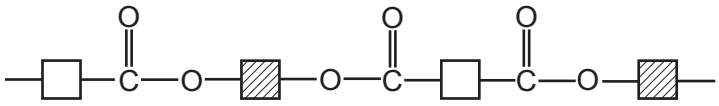


Z



	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}

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	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.).