



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

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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.



- 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.

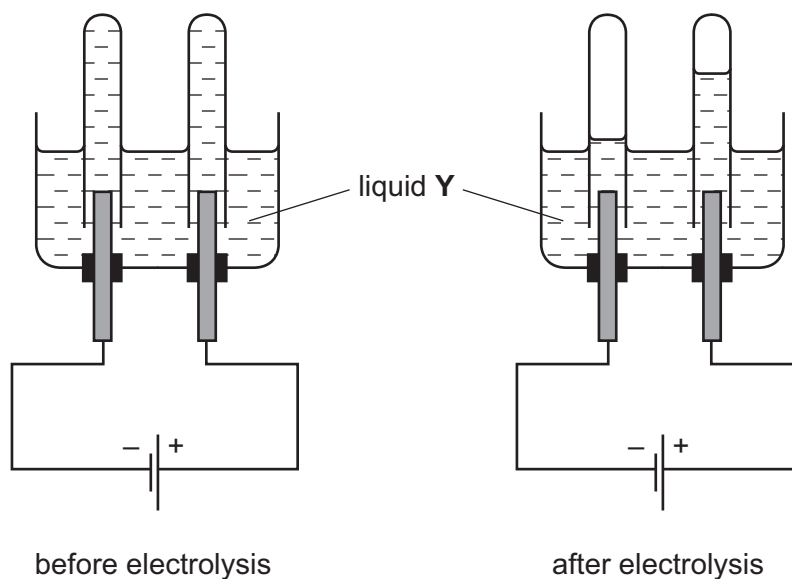
What is the formula for the hydride of X ?

- 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

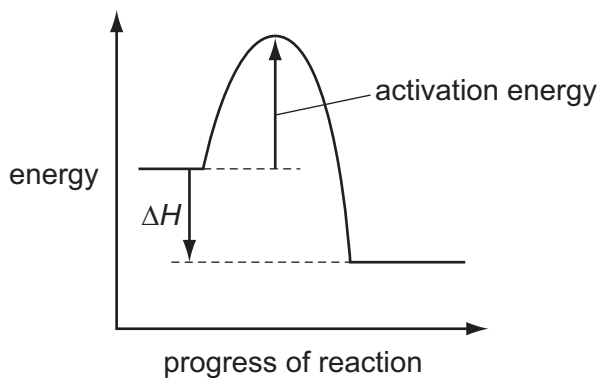
15 The diagrams show an electrolysis experiment using inert electrodes.



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 $\text{Ag}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \rightarrow \text{AgCl}(\text{s})$
 B $2\text{H}^+(\text{aq}) + \text{CO}_3^{2-}(\text{aq}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$
 C $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l})$
 D $\text{Zn}(\text{s}) + \text{Cu}^{2+}(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + \text{Cu}(\text{s})$

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 ₄ Cl(s)	NaOH(aq) and Mg(s)	H ₂ SO ₄ (aq) and NH ₄ Cl(s)	H ₂ SO ₄ (aq) and Mg(s)
A	✓	x	✓	x
B	✓	x	x	✓
C	x	✓	✓	x
D	x	✓	x	✓

key

✓ = gas forms

x = no gas forms

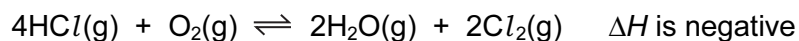
19 Four oxides are added separately to aqueous sodium hydroxide.

- 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.



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 $\text{HCl}(\text{g})$
 - 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 MO 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

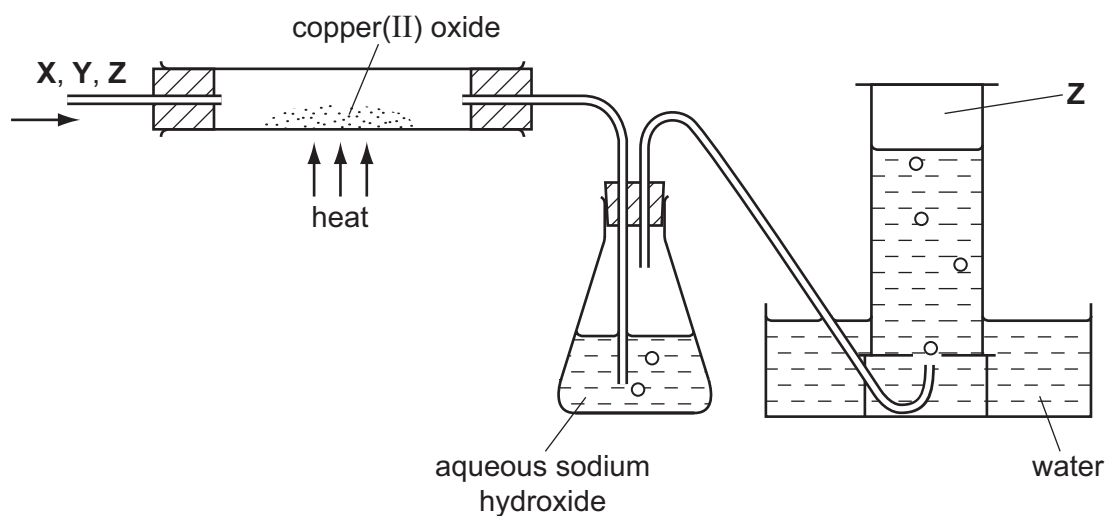
26 An atom of which element has the same electronic configuration as the strontium ion?

- 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.



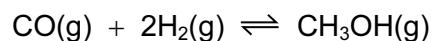
For which mixture will this system work successfully?

	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

- 30 Methanol is manufactured using the following reaction.

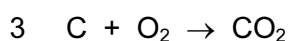
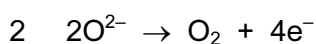
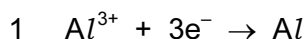


The usual conditions are 30 atmospheres and 300 °C.

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.



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 $\text{CO}(\text{NH}_2)_2$ and NH_4NO_3 are used as fertilisers.

The proportion of nitrogen by mass in $\text{CO}(\text{NH}_2)_2$ is1..... that in NH_4NO_3 .

The proportion of nitrogen by mole in $\text{CO}(\text{NH}_2)_2$ is2..... 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

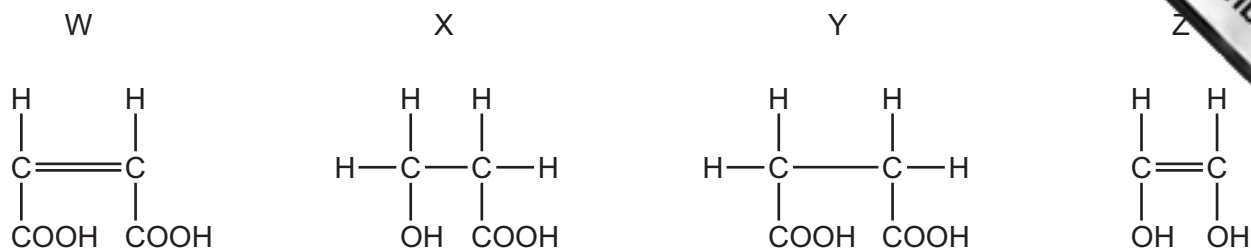
35 Which organic compound requires the least oxygen for the complete combustion of one mole of the compound?

- A** $\text{C}_3\text{H}_7\text{OH}$ **B** $\text{C}_3\text{H}_7\text{COOH}$ **C** C_3H_8 **D** C_4H_8

36 Which polymer contains only three elements?

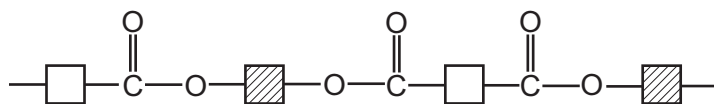
- A** protein
- B** poly(ethene)
- C** poly(propene)
- D** starch

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

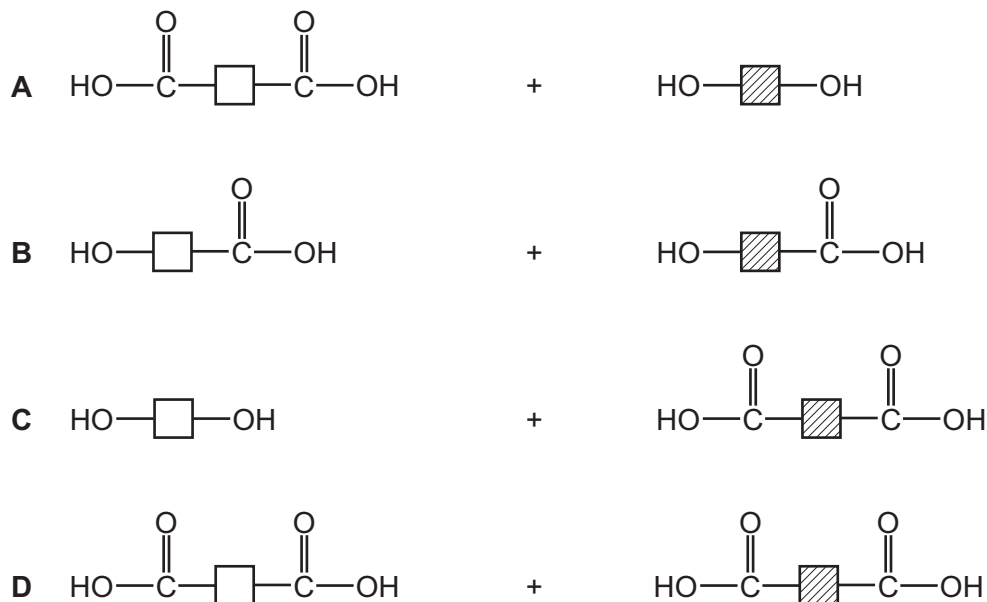


	decolourises aqueous bromine	has a pH of less than 7	reacts with a carboxylic acid to form an ester
A	X and Y	W, X and Y	W, X, Y and Z
B	X and Y	X and Z	X and Z
C	W and Z	W, X and Y	X and Z
D	W and Z	X and Z	W, X and Y

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



From which pair of compounds is it made?



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

DATA SHEET
The Periodic Table of the Elements

		Group																		
		I	II	III	IV	V	VI	VII	VIII	IX	X									
		1 H Hydrogen 1																		
		4 He Helium 2																		
7	3	9 Li Lithium 4	24 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	35 Cl Chlorine 17	40 Ar Argon 18									
23	11	13 Na Sodium 11	12 Mg Magnesium 12	13 Al Aluminium 13	14 Si Silicon 14	15 P Phosphorus 15	16 S Sulfur 16	17 Cl Chlorine 17	18 Ar Argon 18	35 Cl Chlorine 17	40 Ar Argon 18									
39	19	19 K Potassium 19	20 Ca Calcium 20	21 Sc Scandium 21	22 Ti Titanium 22	23 V Vanadium 23	24 Cr Chromium 24	25 Mn Manganese 25	26 Fe Iron 26	27 Co Cobalt 27	28 Ni Nickel 28	29 Cu Copper 29	30 Zn Zinc 30	31 Ga Gallium 31	32 Ge Germanium 32	33 As Arsenic 33	34 Se Selenium 34	35 Br Bromine 35	36 Kr Krypton 36	54 Xe Xenon 54
85	37	37 Rb Rubidium 37	38 Sr Strontium 38	39 Y Yttrium 39	40 Zr Zirconium 40	41 Nb Niobium 41	42 Mo Molybdenum 42	43 Tc Technetium 43	44 Ru Ruthenium 44	45 Rh Rhodium 45	46 Pd Palladium 46	47 Ag Silver 47	48 Cd Cadmium 48	49 In Indium 49	50 Sn Tin 50	51 Sb Antimony 51	52 Te Tellurium 52	53 I Iodine 53	54 Xe Xenon 54	86 Rn Radon 86
133	55	55 Cs Caesium 55	56 Ba Barium 56	57 La Lanthanum 57	58 Ce Cerium 58	59 Pr Praseodymium 59	60 Nd Neodymium 60	61 Pm Promethium 61	62 Sm Samarium 62	63 Eu Europium 63	64 Gd Gadolinium 64	65 Tb Terbium 65	66 Dy Dysprosium 66	67 Ho Holmium 67	68 Er Erbium 68	69 Tm Thulium 69	70 Yb Ytterbium 70	71 Lu Lutetium 71	86 Rn Radon 86	103 Lr Lawrencium 103
226	87	87 Fr Francium 87	88 Ra Radium 88	89 Ac Actinium 89	90 Th Thorium 90	91 Pa Protactinium 91	92 U Uranium 92	93 Np Neptunium 93	94 Pu Plutonium 94	95 Am Americium 95	96 Cm Curium 96	97 Bk Berkelium 97	98 Cf Californium 98	99 Es Einsteinium 99	100 Fm Fermium 100	101 Md Mendelevium 101	102 No Nobelium 102	103 Lr Lawrencium 103	175 Lu Lutetium 71	175 Lu Lutetium 71

*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 dm³ at room temperature and pressure (r.t.p.).

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