



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CHEMISTRY

5070/01

Paper 1 Multiple Choice

May/June 2007

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.

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.

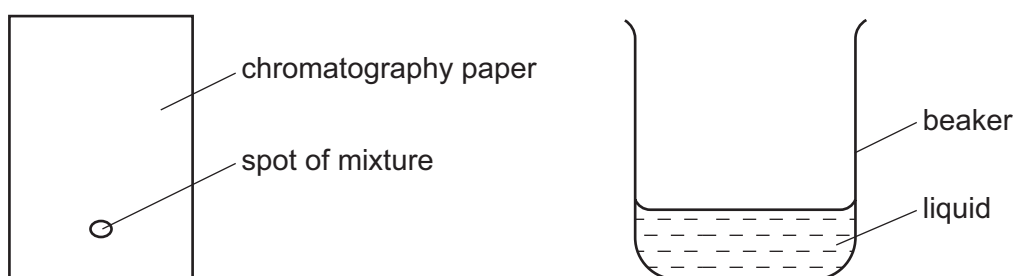
This document consists of **14** printed pages and **2** blank pages.



- 1 Which property of a gas affects the rate at which it spreads throughout a laboratory?
- A boiling point
 - B molecular mass
 - C reactivity
 - D solubility in water

- 2 A mixture of two substances is spotted on to a piece of chromatography paper.

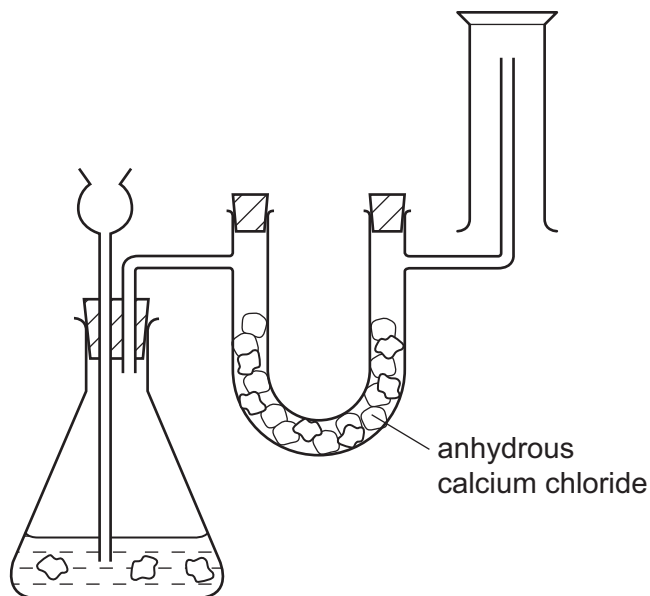
The paper is inserted into a beaker containing a liquid.



For separation of the substances to occur the mixture must

- A be placed so that the spot is just below the level of the liquid.
 - B be soluble in the liquid.
 - C contain substances of the same R_f values.
 - D contain substances that are coloured.
- 3 Which pair of substances are both mixtures?
- A air; water
 - B limewater; water
 - C sea-water; air
 - D sea-water; ethanol

- 4 The diagram shows a simple laboratory apparatus for the preparation and collection of a dry gas.



What is the gas?

- A carbon dioxide
- B chlorine
- C hydrogen
- D hydrogen chloride

- 5 Gas X

- has no effect either on damp red litmus paper or on damp blue litmus paper,
- puts out both a glowing splint and a burning splint.

What is gas X?

- A ammonia
- B carbon dioxide
- C chlorine
- D nitrogen

6 What is the structure of the ion ${}_{38}^{90}\text{Sr}^{2+}$?

	protons	neutrons	electrons
A	38	52	36
B	38	52	38
C	38	90	36
D	52	38	36

7 In which substance is each carbon atom covalently bonded to **only three** other atoms?

- A carbon dioxide
- B diamond
- C graphite
- D methane

8 In which pair of substances does each have a giant molecular structure?

- A diamond, iodine
- B diamond, silica (sand)
- C iodine, methane
- D methane, silica (sand)

9 How does a magnesium atom form a bond with an oxygen atom?

- A by giving one pair of electrons to the oxygen atom
- B by sharing one pair of electrons, both electrons provided by the magnesium atom
- C by sharing two pairs of electrons, both pairs provided by the oxygen atom
- D by sharing two pairs of electrons, each atom donating one pair of electrons

10 Metals have positive ions in a 'sea of electrons'.

Which metal atom provides most electrons for the sea?

- A aluminium
- B calcium
- C magnesium
- D sodium

- 11 The element X forms a gaseous molecule X_2 . One volume of X_2 combines with one volume of hydrogen to form two volumes of a gaseous hydride.

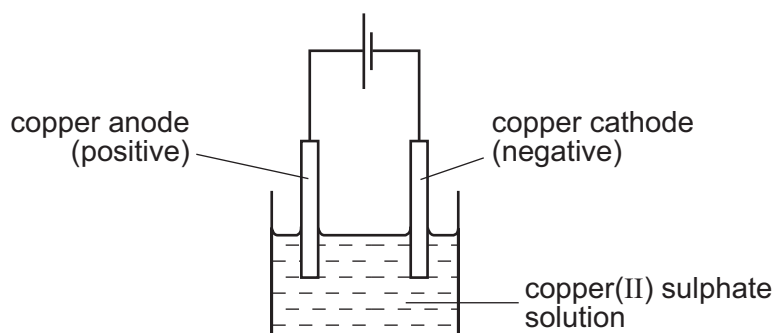
What is the formula for the hydride of X?

- A HX B HX_2 C H_2X D H_2X_2

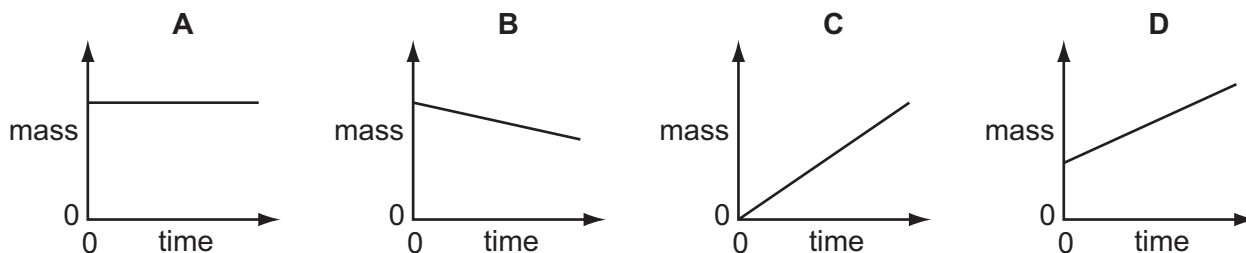
- 12 Which substance has the highest percentage by mass of nitrogen?

- A NH_4NO_3 $M_r = 80$
 B $(NH_4)_2SO_4$ $M_r = 132$
 C $CO(NH_2)_2$ $M_r = 60$
 D $(NH_4)_3PO_4$ $M_r = 149$

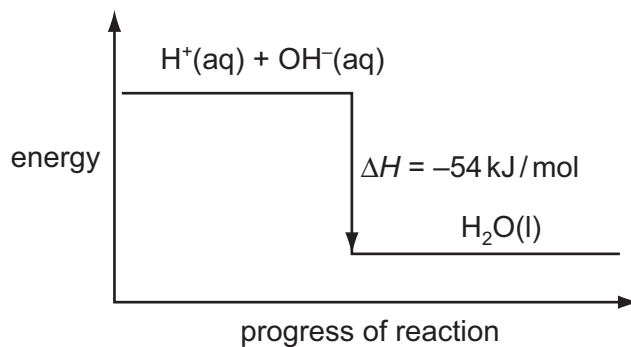
- 13 The diagram shows the electrolysis of aqueous copper(II) sulphate using copper electrodes.



Which graph shows how the mass of the cathode changes during electrolysis?



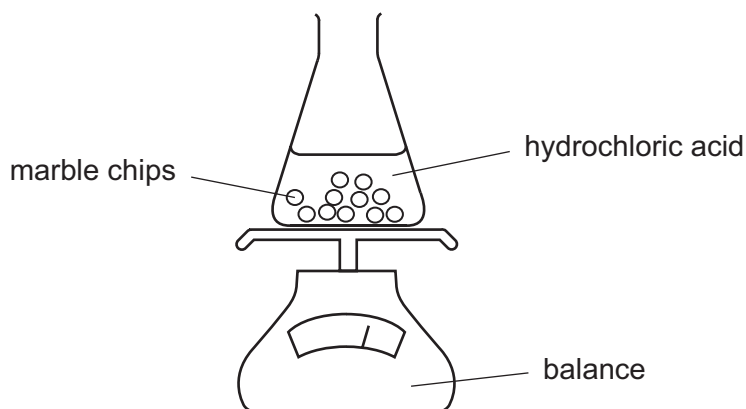
14 The energy diagram for the reaction between sodium hydroxide and hydrochloric acid is shown.



What can be deduced from the diagram?

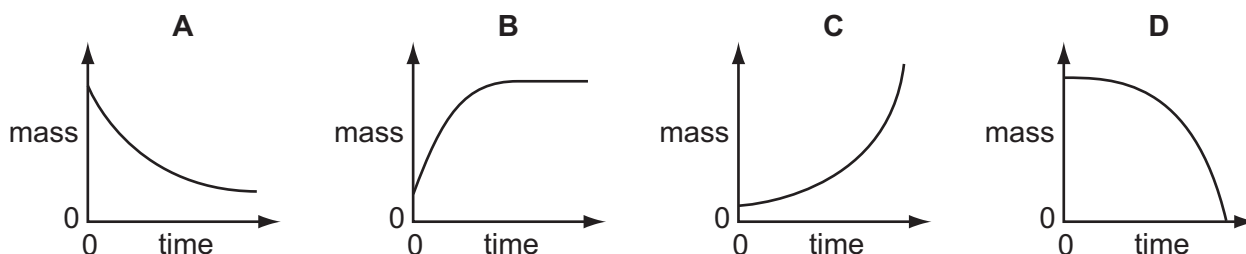
- A Heat is needed to start the reaction.
- B The products contain less energy than the reactants.
- C The reaction is rapid.
- D The OH^- ions have more energy than the H^+ ions.

15 A student adds marble chips to hydrochloric acid.



The mass of flask and contents is measured at regular time intervals.

Which graph shows the result?



16 In which change is the nitrogen reduced?

- A NH_3 to NO
- B NH_3 to NO_3^-
- C N_2 to NH_3
- D N^{3-} to N_2

17 The equation shows the reaction for the formation of sulphur trioxide.



Which change in reaction conditions would produce more sulphur trioxide?

- A adding more catalyst
- B decreasing the pressure
- C increasing the temperature
- D removing some sulphur trioxide

18 Which salt can be prepared by an acid-alkali titration method?

- A ammonium sulphate
- B copper(II) sulphate
- C iron(II) sulphate
- D zinc sulphate

19 The table shows properties of four chlorides.

Which is magnesium chloride?

	colour	solubility in water	method of preparation
A	green	soluble	metal and acid
B	white	insoluble	precipitation
C	white	soluble	metal and acid
D	green	insoluble	precipitation

20 Why is ethanoic acid described as a weak acid?

- A It is only slightly ionised in water.
- B It is a poor conductor of electricity.
- C It is an organic acid.
- D It reacts only with very reactive metals.

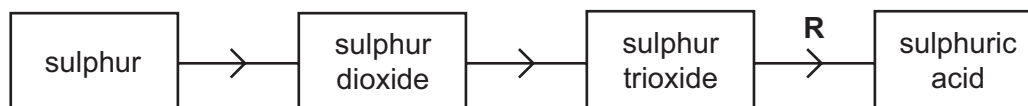
21 Which pair of substances produce a precipitate when their aqueous solutions are mixed?

- A barium nitrate, silver nitrate
- B sodium chloride, barium nitrate
- C sodium nitrate, barium chloride
- D sodium sulphate, barium chloride

22 Ammonia may be obtained from ammonium chloride by heating with

- A aqueous calcium chloride.
- B aqueous sodium hydroxide.
- C dilute hydrochloric acid.
- D water.

23 The diagram represents the manufacture of sulphuric acid by the Contact process.



What is used in step **R**?

- A vanadium(V) oxide
 - B water only
 - C water followed by concentrated sulphuric acid
 - D concentrated sulphuric acid followed by water
- 24 Rubidium, Rb, is an element in Group I of the Periodic Table.
- Which statement about rubidium is correct?
- A It reacts slowly with water.
 - B It forms an insoluble hydroxide.
 - C It is liberated at the cathode during the electrolysis of an aqueous solution of its chloride.
 - D It forms a sulphate, Rb_2SO_4 .
- 25 The element sulphur, S, is in Group VI of the Periodic Table.

Which formula is **incorrect**?

- A S^{2-}
- B S_2O_3
- C SO_4^{2-}
- D SO_3

26 The table shows some of the properties of four elements.

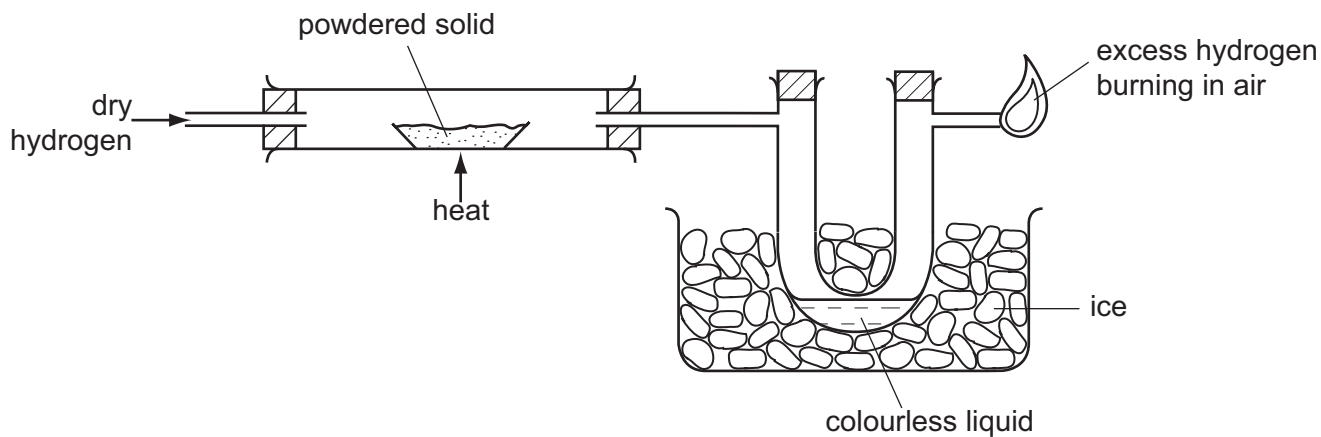
Which element is **most** likely to be a transition metal?

	melting point °C	density g/cm ³	electrical conductivity
A	3550	3.5	poor
B	1860	7.2	good
C	660	2.7	good
D	232	7.3	good

27 Which equation represents the reaction of calcium with cold water?

- A** $\text{Ca} + \text{H}_2\text{O} \rightarrow \text{CaO} + \text{H}_2$
- B** $2\text{Ca} + 2\text{H}_2\text{O} \rightarrow 2\text{CaOH} + \text{H}_2$
- C** $\text{Ca} + 2\text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2 + \text{H}_2$
- D** $\text{Ca} + 2\text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2 + 2\text{H}_2$

28 Dry hydrogen gas is passed over a powdered solid and then through a cooled U-tube before the excess of hydrogen is burned in air.



A colourless liquid collects in the U-tube.

What could the powdered solid be?

- A** calcium oxide
- B** copper(II) oxide
- C** magnesium
- D** zinc oxide

- 29 A coil of clean copper wire is suspended in aqueous silver nitrate. Crystals of silver are deposited on the copper wire.

Which statement is **not** correct?

- A The copper is oxidised.
- B The total mass of the crystals of silver increases gradually.
- C The total number of positive ions in the solution is unchanged.
- D The solution turns blue.

- 30 Zinc and aluminium both react with dilute hydrochloric acid.

Why does zinc react more quickly than aluminium?

- A Aluminium is lower than hydrogen in the reactivity series.
- B Aluminium has an oxide coating.
- C Zinc is an amphoteric element.
- D Zinc is a transition metal.

- 31 Which metal is used in the sacrificial protection of iron pipes?

- A copper
- B lead
- C magnesium
- D sodium

- 32 Some metals can be obtained by the reduction of their oxides with hydrogen.

Which line of the table is correct?

	aluminium	copper	silver	sodium
A	✓	✓	x	x
B	x	✓	✓	x
C	x	x	✓	✓
D	✓	x	✓	x

key

✓ = can be obtained

x = cannot be obtained

- 33 The table shows pollutants which cause eutrophication, sources of these pollutants and a problem that eutrophication causes.

Which entry in the table is correct?

	pollutant	source	problem
A	nitrates	detergents	oxygen depletion
B	nitrates	fertilisers	excess oxygen
C	phosphates	detergents	oxygen depletion
D	phosphates	fertilisers	excess oxygen

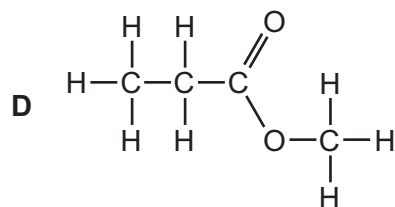
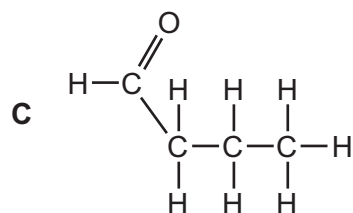
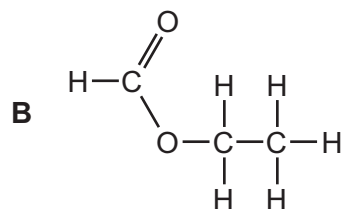
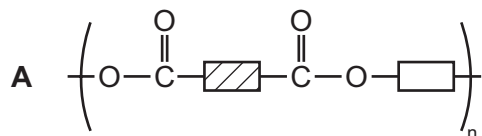
- 34 Which gas burns in air to form a single product?

- A** ammonia
- B** carbon monoxide
- C** hydrogen chloride
- D** methane

- 35 Which pair of statements about the combustion of a carbohydrate and its formation by photosynthesis is **not** correct?

	combustion	photosynthesis
A	reaction exothermic	reaction endothermic
B	oxygen used up	oxygen set free
C	no catalyst needed	catalyst needed
D	chemical energy converted to heat energy	chemical energy converted to light energy

36 Which of the following has **not** been prepared by reacting a carboxylic acid with an alcohol?



37 Which compound is obtained by the oxidation of ethanol, C_2H_5OH ?

- A HCO_2CH_3
- B $C_2H_5CO_2H$
- C CH_3OH
- D CH_3CO_2H

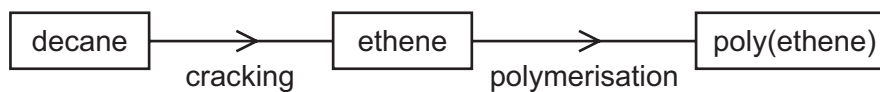
38 Which statement applies to all three of the compounds ethane, ethene and ethanol?

- A One molecule of each compound contains the same number of carbon atoms.
- B One mole of each compound contains the same number of hydrogen atoms.
- C They all occur in crude oil.
- D They are all liquids at room temperature.

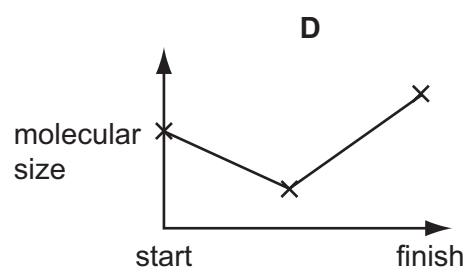
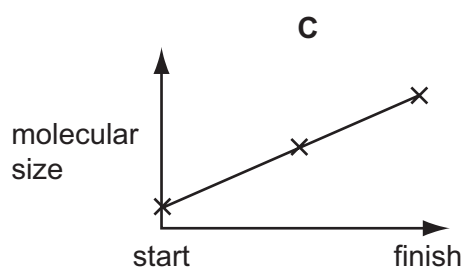
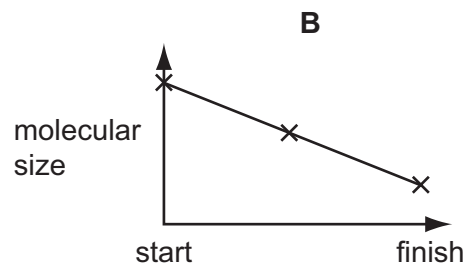
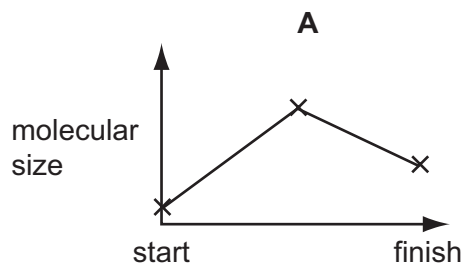
39 What is the empirical formula of ethanoic acid?

- A CH_2O
- B CH_4O
- C C_2H_3O
- D $C_2H_4O_2$

40 Poly(ethene) can be manufactured by the process below.



Which diagram shows the change in molecular size during this process?



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DATA SHEET
The Periodic Table of the Elements

		Group																																	
		I	II	III	IV	V	VI	VII	0																										
		<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>1</td> <td>H Hydrogen 1</td> <td colspan="9"></td> </tr> </table>										1	H Hydrogen 1																						
1	H Hydrogen 1																																		
7	Li Lithium 3	9	Be Beryllium 4											20	Ne Neon 10																				
23	Na Sodium 11	24	Mg Magnesium 12											35.5	Cl Chlorine 17																				
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	101	Ru Ruthenium 44	106	Pd Palladium 46	108	Ag Silver 47	112	Cd Cadmium 48	115	In Indium 49	122	Sb Antimony 51	128	Te Tellurium 52	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	190	Os Osmium 76	195	Pt Platinum 78	197	Au Gold 79	201	Hg Mercury 80	204	Tl Thallium 81	209	Pb Lead 82	207	Po Polonium 84	210	At Astatine 85	226	Ra Radium 88	227	Ac Actinium 89	227	Fr Francium 87		

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

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

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).