CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CHEMISTRY **5070/01**

Paper 1 Multiple Choice

May/June 2003

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 to be found on page 16.

This document consists of **16** printed pages.

SP (SM) S45376/2

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

[Turn over

1 The equation for the reaction between aqueous lead(II) nitrate and aqueous potassium iodide is shown.

$$\underset{\text{colourless}}{Pb(NO_3)_2(aq)} + \underset{\text{colourless}}{2KI(aq)} \longrightarrow \underset{\text{yellow}}{PbI_2(s)} + \underset{\text{colourless}}{2KNO_3(aq)}$$

Which method could be used to separate the products?

A chromatography

B crystallisation

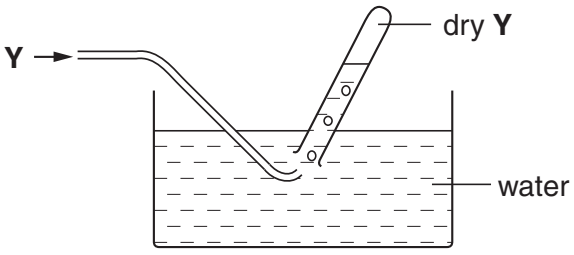
C distillation

D filtration

2 A gas **Y**, is less dense than air, very soluble in water and is an alkali.

Which method is used to collect a dry sample of the gas?

A



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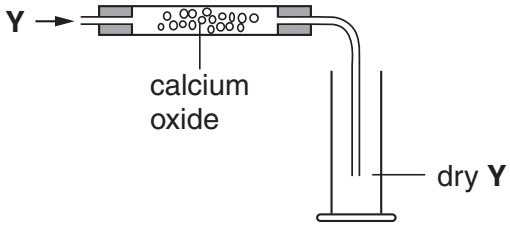

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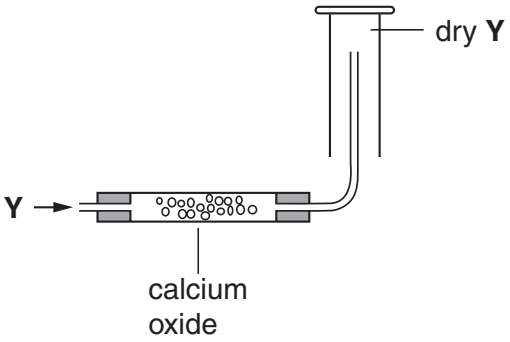

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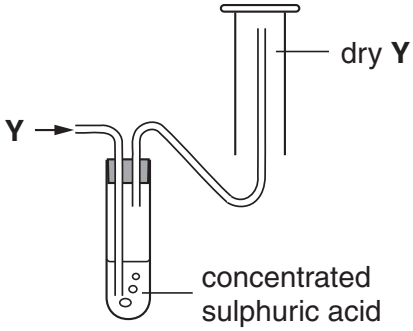
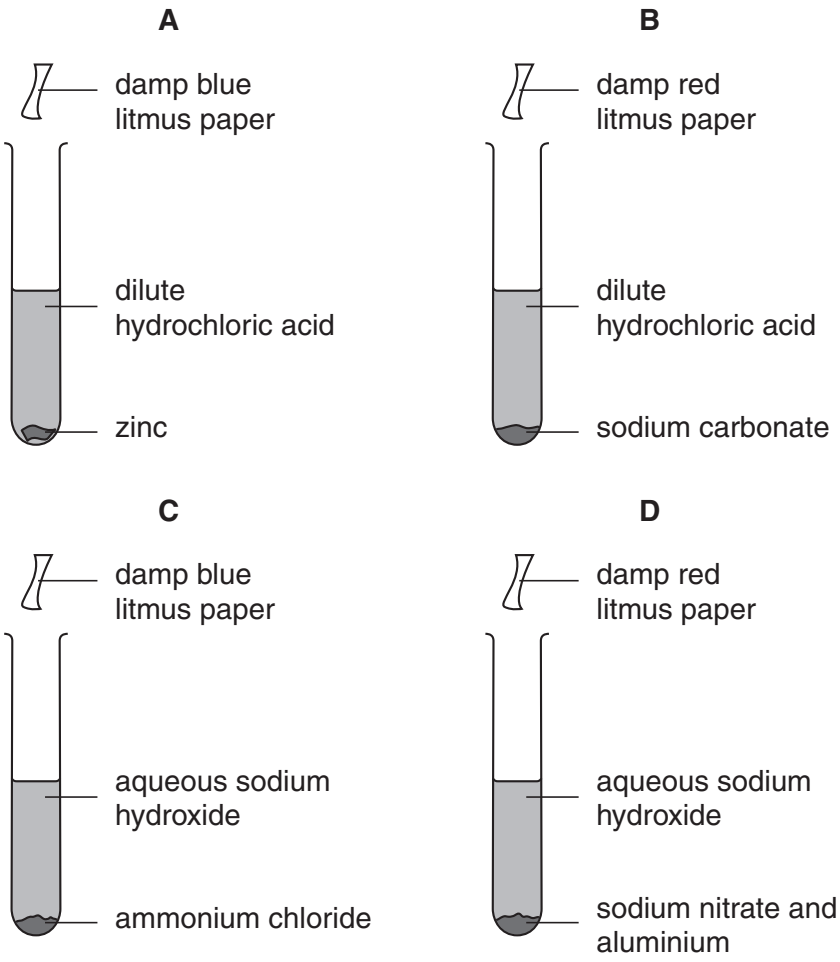


3 The diagrams show mixtures of chemicals that react to produce gases.

In which reaction will the litmus paper change colour?

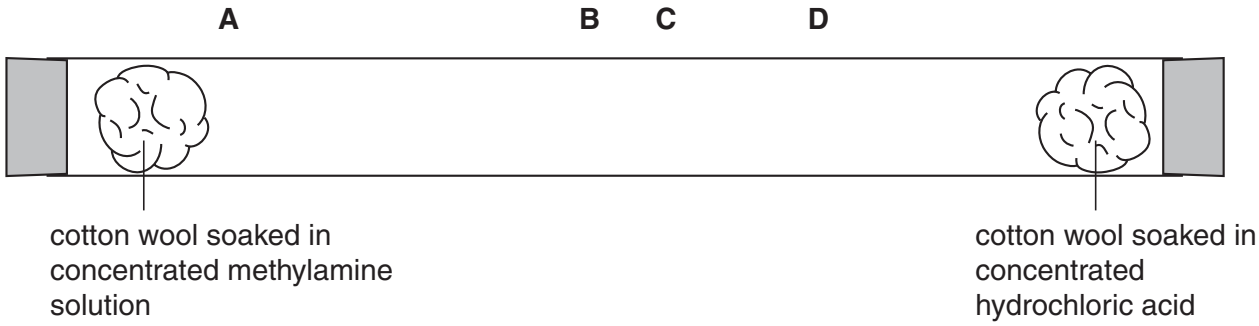


4 Methylamine, CH_3NH_2 ($M_r = 31$), and hydrogen chloride, HCl ($M_r = 36.5$) are both gases which are soluble in water.

The gases react together to form a white solid, methylammonium chloride.

In an experiment to demonstrate rates of diffusion the following apparatus is set up.

Where will the white solid form?



[Turn over

5 A 25 cm^3 sample of dilute sulphuric acid contains 0.025 moles of the acid.

What is the hydrogen ion concentration in the solution?

A 0.25 mol / dm^3

B 0.50 mol / dm^3

C 1.00 mol / dm^3

D 2.00 mol / dm^3

6 For which of the following can graphite be used?

A as an abrasive only

B as an abrasive and as an electrode

C as an electrode and as a lubricant

D as a lubricant only

7 The letters X, Y and Z represent different atoms.

$^{40}_{19}X$ $^{39}_{19}Y$ $^{40}_{20}Z$

What can be deduced from the proton numbers and nucleon numbers of X, Y and Z?

A X and Y are the same element.

B X and Z are the same element.

C X has more protons than Y.

D Z has more neutrons than Y.

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

A by giving one pair of electrons to the oxygen atom

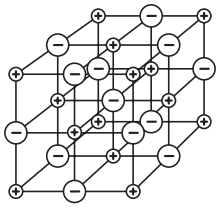
B by sharing one pair of electrons, both electrons provided by the magnesium atom

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

9 Which diagram represents the structure of the metal sodium?

A



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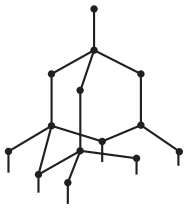

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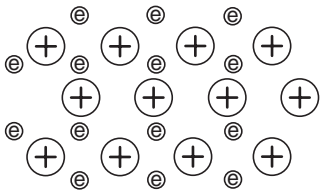

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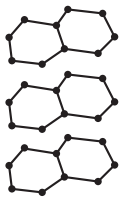


10 Elements X and Y combine to form the gas XY_2.

What are X and Y?

	X	Y
A	calcium	chlorine
B	carbon	hydrogen
C	carbon	oxygen
D	hydrogen	oxygen

11 Which of the following contains the same number of electrons as an atom of neon?

A Cl^-

B Li

C Li^+

D O^{2-}

12 Which sulphide contains the greatest mass of sulphur in a 10 g sample?

sulphide	formula	mass of one mole / g
A	NiS	90
B	FeS_2	120
C	MoS_2	160
D	PbS	239

[Turn over

13 124 g of phosphorus vapour has the same volume as 71 g of chlorine gas at the same temperature and pressure.

What is the formula of a molecule of phosphorus?

A P_8 **B** P_4 **C** P_2 **D** P

14 A piece of metal is to be electroplated.

Which set of conditions give the thickest plate?

	type of current	size of current	time
A	a.c.	low	short
B	d.c.	high	long
C	a.c.	high	short
D	d.c.	low	long

15 Rubidium is above sodium in the reactivity series.

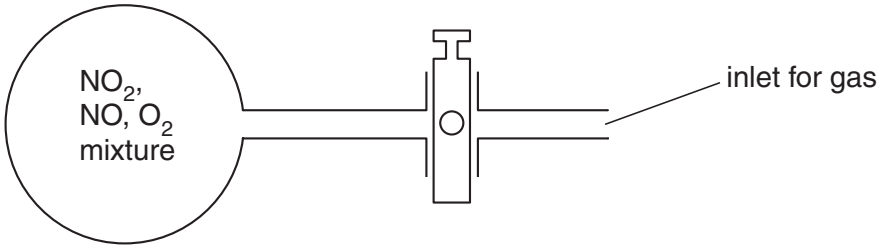
What is formed when concentrated aqueous rubidium chloride is electrolysed?

	products	
	cathode (–)	anode (+)
A	chlorine	hydrogen
B	hydrogen	rubidium
C	hydrogen	chlorine
D	rubidium	chlorine

16 Nitrogen dioxide, NO_2, is a dark brown gas that decomposes as shown by the equilibrium equation.

$$\underset{\text{dark brown}}{2NO_2(g)} \rightleftharpoons \underset{\text{colourless}}{2NO(g) + O_2(g)}$$

The diagram shows a glass flask containing a mixture of the three gases.
The mixture is pale brown.



More oxygen is forced into the flask.

What colour change is seen in the mixture?

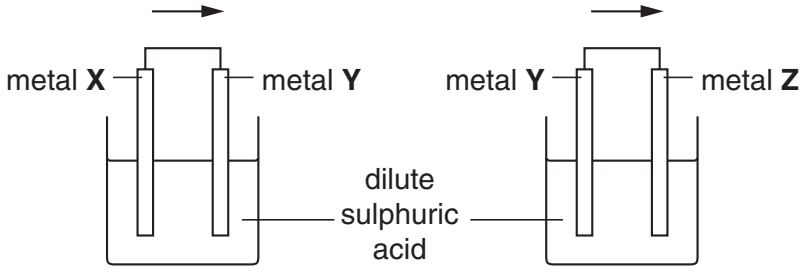
A there is no change

B it turns colourless

C it becomes darker brown

D it becomes a paler brown

17 Two cells were set up as shown in the diagram. The arrow shows the direction of electron flow in the external circuit.



Which set of metals would give the electron flows in the direction shown?

	metal **X**	metal **Y**	metal **Z**
A	Ag	Cu	Zn
B	Ag	Zn	Cu
C	Cu	Zn	Ag
D	Zn	Cu	Ag

[Turn over

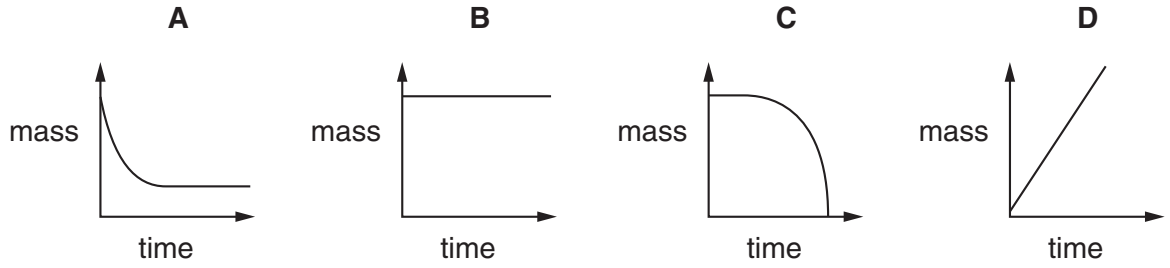
18 The equation shows the effect of heat on copper(II) carbonate.

$$CuCO_3(s) \longrightarrow CuO(s) + CO_2(g)$$

A known mass of copper(II) carbonate was placed in an open crucible and heated until no more change occurred.

The mass of the crucible and contents was weighed every minute during the heating.

Which graph shows what happens to the mass of the crucible and contents?



19 Substance X liberates iodine from aqueous potassium iodide and decolourises acidified aqueous potassium manganate(VII).

How is the behaviour of X described?

A as an oxidising agent only

B as an oxidising agent and a reducing agent

C as neither an oxidising agent nor a reducing agent

D as a reducing agent only

20 Salts are made by reacting acids with bases.

For which combination of acids and bases is the titration method of preparation suitable?

A an insoluble acid with an insoluble base

B an insoluble acid with a soluble base

C a soluble acid with an insoluble base

D a soluble acid with a soluble base

21 The following equations represent reactions of dilute sulphuric acid.

Which reaction is not 'typical' of a dilute acid?

A $2KOH(aq) + H_2SO_4(aq) \longrightarrow K_2SO_4(aq) + 2H_2O(l)$

B $CuO(s) + H_2SO_4(aq) \longrightarrow CuSO_4(aq) + H_2O(l)$

C $Pb(NO_3)_2(aq) + H_2SO_4(aq) \longrightarrow PbSO_4(s) + 2HNO_3(aq)$

D $ZnCO_3(s) + H_2SO_4(aq) \longrightarrow ZnSO_4(aq) + CO_2(g) + H_2O(l)$

22 A black powder is burned in air.

The gas produced dissolves in water to form solution **R**. The pH of **R** is close to 7.

The gas is readily absorbed in aqueous sodium hydroxide.

What type of substance is present in solution **R**?

A strong acid

B strong base

C weak acid

D weak base

23 The results of three halogen displacement experiments are shown.

The table shows the results.

experiment	halogen added	halide solution		
		X^-	Y^-	Z^-
1	X_2	–	Y_2 displaced	Z_2 displaced
2	Y_2	no reaction	–	no reaction
3	Z_2	no reaction	Y_2 displaced	–

What are halogens X, Y and Z?

	X	Y	Z
A	Br	C*l*	I
B	Br	I	C*l*
C	C*l*	Br	I
D	C*l*	I	Br

24 Which statement about the Periodic Table is correct?

A the melting point of the elements increases down Group I

B the reactivity of the elements increases down Group VII

C the reactivity of the elements decreases down Group I

D the colour of the elements becomes darker down Group VII

[Turn over

25 In which process is a catalyst **not** used?

A The Blast furnace for the manufacture of iron.

B The Contact process for the manufacture of sulphuric acid.

C The Haber process for the manufacture of ammonia.

D The manufacture of margarine from unsaturated vegetable oils.

26 The table shows the results of two tests carried out on separate portions of a solution of salt **X**.

test	observation
1 acidified aqueous barium nitrate added	white precipitate
2 aqueous sodium hydroxide added	white precipitate soluble in an excess of aqueous sodium hydroxide

What is **X**?

A calcium chloride

B iron(II) sulphate

C lead(II) nitrate

D zinc sulphate

27 Why is cryolite, Na_3AlF_6, used in the extraction of aluminium from aluminium oxide?

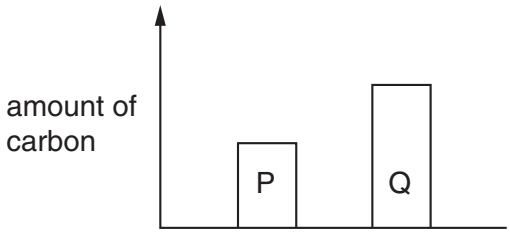
A to dissolve aluminium oxide

B to prevent the anodes from burning away

C to prevent the oxidation of aluminium

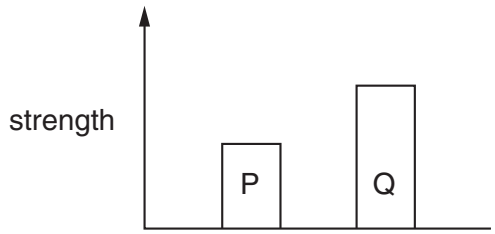
D to remove the impurities from the aluminium oxide

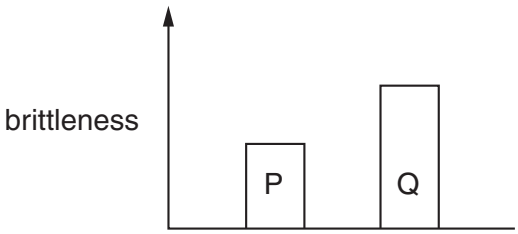
28 The diagram compares the amount of carbon in two steels, P and Q.



Which two diagrams correctly compare the strength and brittleness of P and Q?

A





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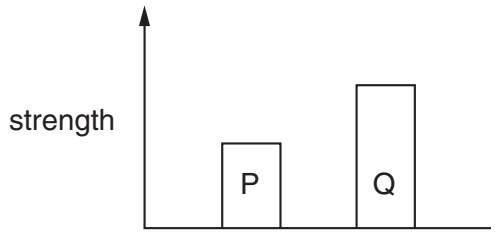

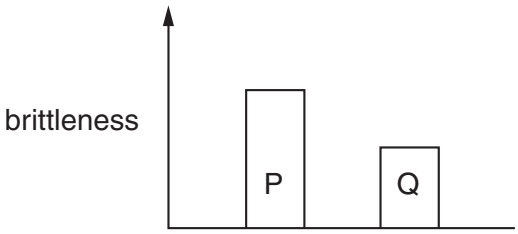

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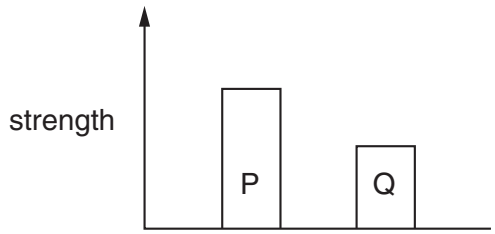

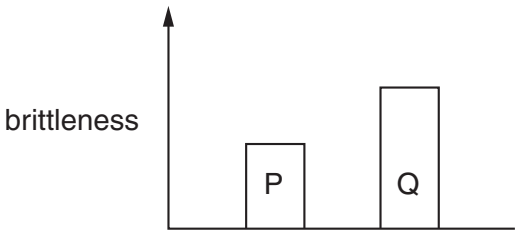

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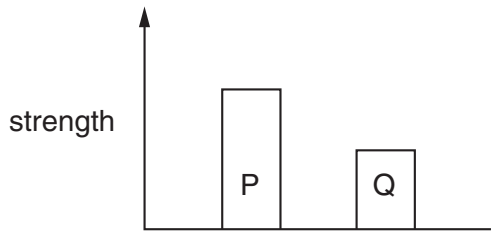
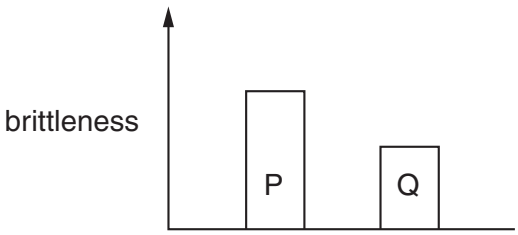




[Turn over

29 An experiment is carried out to find the order of reactivity of some metals.

Three metals are placed in solutions containing aqueous metal ions.

The results are shown.

metal	aqueous metal ions			
	Mg^{2+}	Al^{3+}	Fe^{2+}	Zn^{2+}
Mg		✓	✓	✓
Fe	✗	✗		✗
Zn	✗	✗	✓	

key

✓ = reaction observed

✗ = no reaction observed

What is the order of reactivity (most reactive first)?

A Mg Zn Fe Al

B Fe Zn Al Mg

C Mg Al Zn Fe

D Mg Al Fe Zn

30 The carbonate of metal **X** is a white solid. It decomposes when heated. Carbon dioxide and a yellow solid oxide are formed.

What is metal **X**?

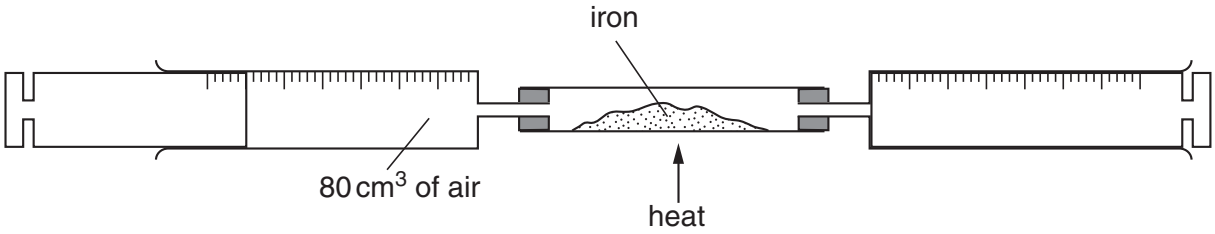
A copper

B iron

C lead

D sodium

31 An 80 cm^3 sample of air is trapped in a syringe. The air is slowly passed over heated iron in a tube until there is no further decrease in volume.



When cooled to the original temperature, which volume of gas remains?

A 80 cm^3 **B** 64 cm^3 **C** 20 cm^3 **D** 16 cm^3

32 In the Haber process, nitrogen and hydrogen react to form ammonia.

What is the source of the hydrogen?

A air

B oil

C limestone

D sulphuric acid

33 Which reaction will **not** occur using cold, dilute sulphuric acid?

A formation of copper(II) sulphate from copper(II) oxide

B formation of copper(II) sulphate from copper

C formation of hydrogen from magnesium metal

D formation of carbon dioxide from sodium carbonate

34 Why are catalytic converters fitted to car exhausts?

A to decrease the amount of carbon dioxide emitted

B to decrease the amount of nitrogen oxides emitted

C to improve energy conservation

D to reduce global warming

35 Why is carbon used in the purification of drinking water?

A disinfects the water

B filters out solids

C removes tastes and odours from the water

D desalinates the water

36 What is produced when ethanol is boiled with an excess of acidified potassium dichromate(VI)?

A ethane

B ethanoic acid

C ethene

D ethyl ethanoate

[Turn over

37 When 1 volume of gas X reacts with exactly 5 volumes of oxygen it forms carbon dioxide and water only.

What is gas X?

A methane, CH_4

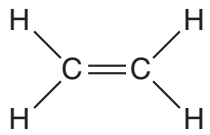
B ethane, C_2H_6

C propane, C_3H_8

D butane, C_4H_{10}

38 Which structure shows a compound that reacts with ethanol to give a sweet-smelling liquid?

A



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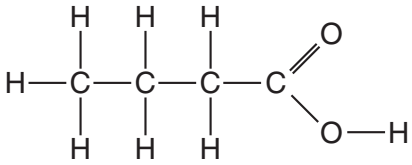

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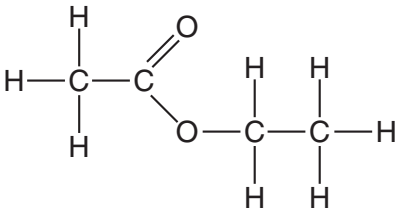

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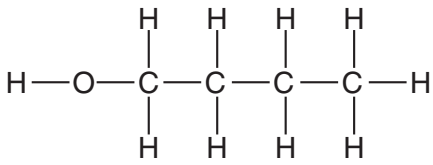

39 The tables shows the properties of four compounds.

Which compound could be ethanoic acid?

compound	degree of ionisation in water	addition of an aqueous solution of the compound to magnesium
A	high	hydrogen produced
B	high	no reaction
C	low	hydrogen produced
D	low	no reaction

40 Amino acids are produced when proteins are

A hydrolysed.

B oxidised.

C polymerised.

D substituted.

DATA SHEET
The Periodic Table of the Elements

Group																	
I	II										III	IV	V	VI	VII	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 Sulphur 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	43 Tc Technetium	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.).