

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.

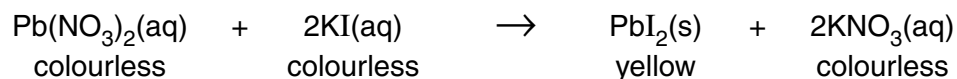
Any rough working should be done in this booklet.

A copy of the Periodic Table is to be found on page 16.

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



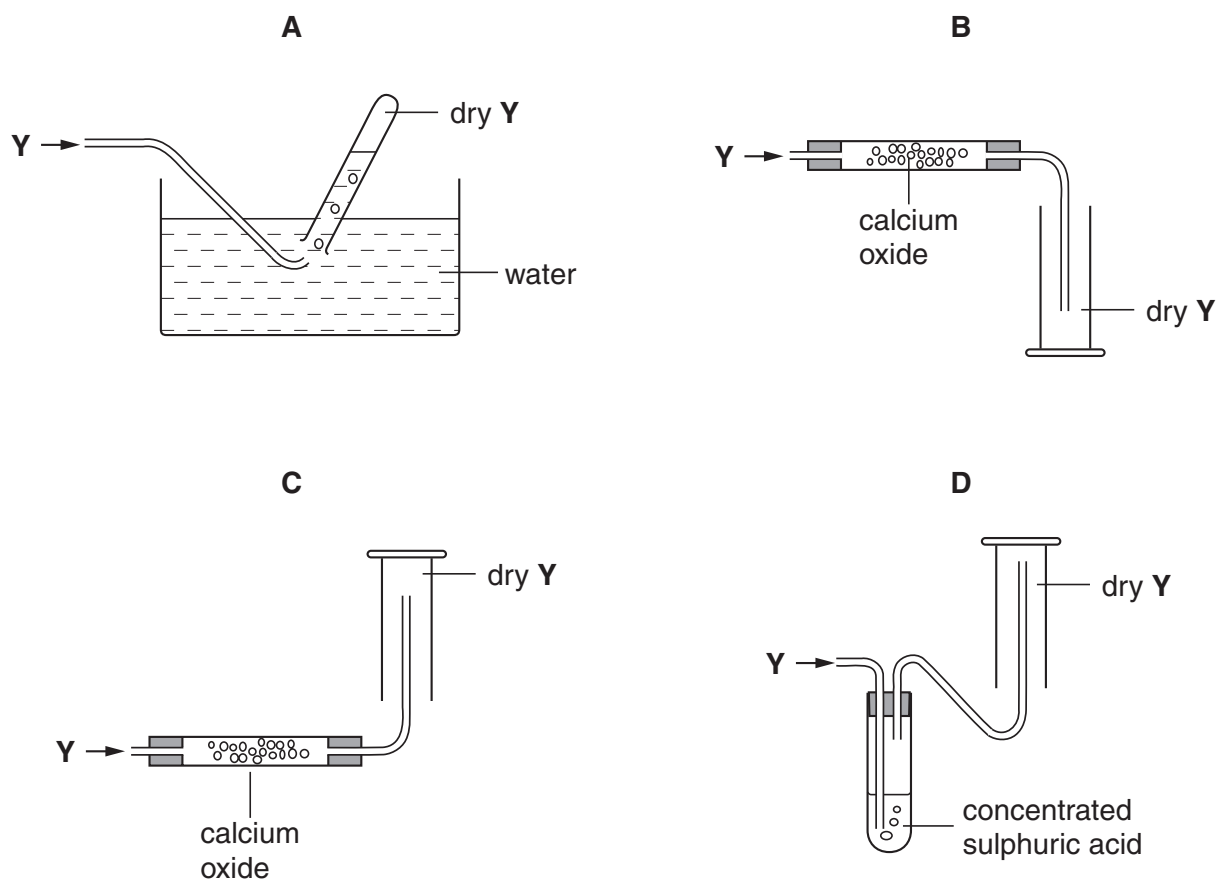
- 1 The equation for the reaction between aqueous lead(II) nitrate and aqueous potassium iodide is shown.



Which method could be used to separate the products?

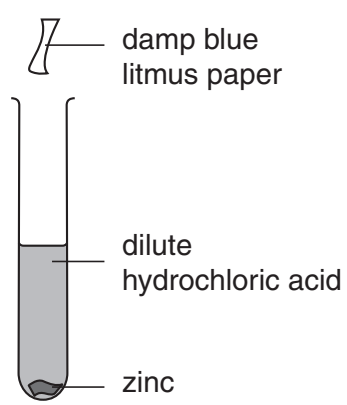
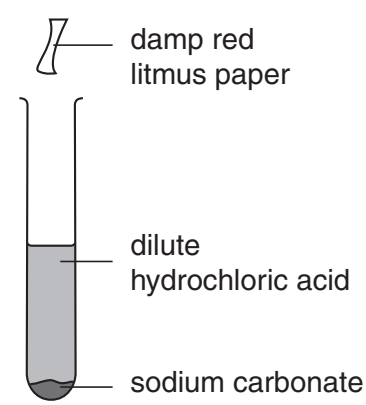
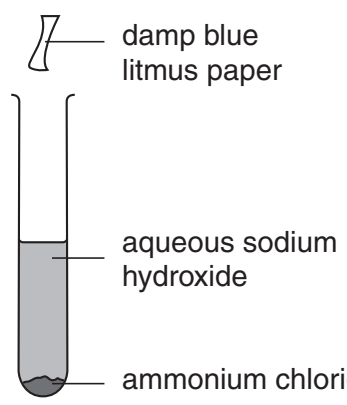
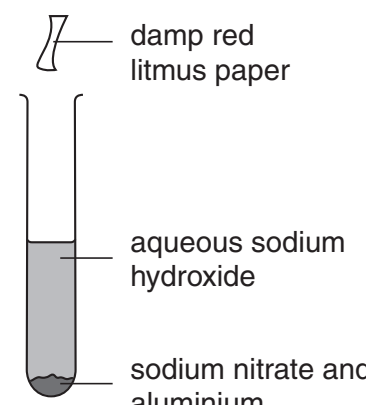
- A chromatography
 B crystallisation
 C distillation
 D filtration
- 2 A gas Y, is less dense than air, very soluble in water and is an alkali.

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



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

In which reaction will the litmus paper change colour?

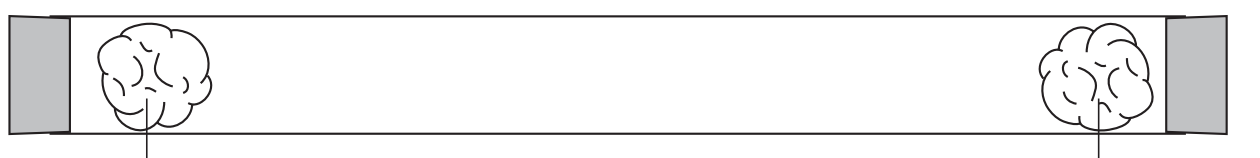
<p>A</p>  <p>damp blue litmus paper</p> <p>dilute hydrochloric acid</p> <p>zinc</p>	<p>B</p>  <p>damp red litmus paper</p> <p>dilute hydrochloric acid</p> <p>sodium carbonate</p>
<p>C</p>  <p>damp blue litmus paper</p> <p>aqueous sodium hydroxide</p> <p>ammonium chloride</p>	<p>D</p>  <p>damp red litmus paper</p> <p>aqueous sodium hydroxide</p> <p>sodium nitrate and aluminium</p>

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.

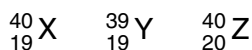
Where will the white solid form?

A	B	C	D
			
<p>cotton wool soaked in concentrated methylamine solution</p>			<p>cotton wool soaked in concentrated hydrochloric acid</p>

- 5 A 25 cm³ sample of dilute sulphuric acid contains 0.025 moles of the acid.

What is the hydrogen ion concentration in the solution?

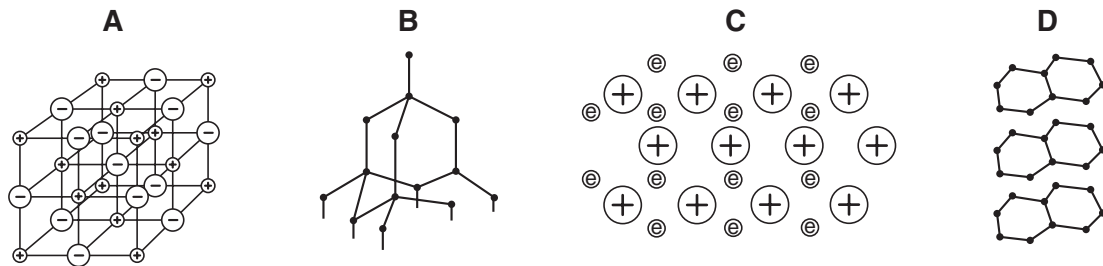
- A 0.25 mol/dm³
 - B 0.50 mol/dm³
 - C 1.00 mol/dm³
 - D 2.00 mol/dm³
- 6 For which of the following can graphite be used?
- A as an abrasive only
 - B as an abrasive and as an electrode
 - C as an electrode and as a lubricant
 - D as a lubricant only
- 7 The letters X, Y and Z represent different atoms.



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?



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

- 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** P₈ **B** P₄ **C** P₂ **D** P

- 14** A piece of metal is to be electroplated.

Which set of conditions give the thickest plate?

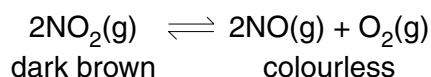
	type of current	size of current	time
A	a.c.	low	short
B	d.c.	high	long
C	a.c.	high	short
D	d.c.	low	long

- 15** Rubidium is above sodium in the reactivity series.

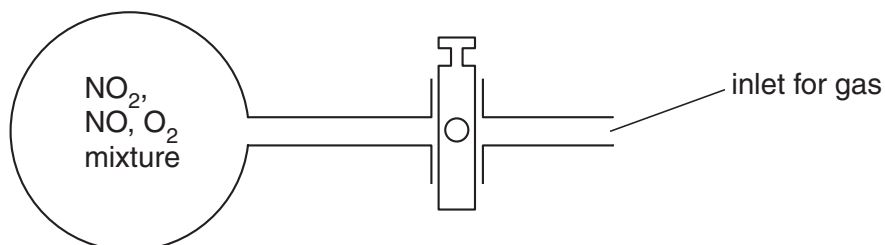
What is formed when concentrated aqueous rubidium chloride is electrolysed?

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.



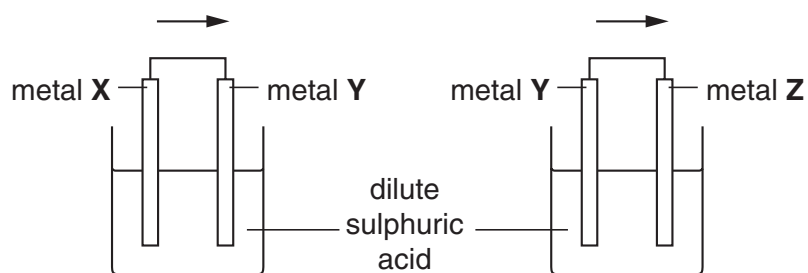
The diagram shows a glass flask containing a mixture of the three gases. The mixture is pale brown.



More oxygen is forced into the flask.

What colour change is seen in the mixture?

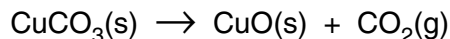
- A** there is no change
B it turns colourless
C it becomes darker brown
D it becomes a paler brown
- 17 Two cells were set up as shown in the diagram. The arrow shows the direction of electron flow in the external circuit.



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

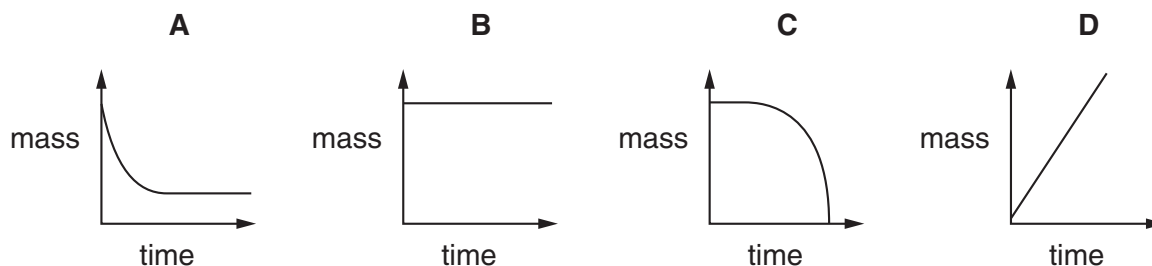
- 18 The equation shows the effect of heat on copper(II) carbonate.



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** $2\text{KOH}(\text{aq}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{K}_2\text{SO}_4(\text{aq}) + 2\text{H}_2\text{O}(\text{l})$
B $\text{CuO}(\text{s}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{CuSO}_4(\text{aq}) + \text{H}_2\text{O}(\text{l})$
C $\text{Pb}(\text{NO}_3)_2(\text{aq}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{PbSO}_4(\text{s}) + 2\text{HNO}_3(\text{aq})$
D $\text{ZnCO}_3(\text{s}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{ZnSO}_4(\text{aq}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$

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	Cl	I
B	Br	I	Cl
C	Cl	Br	I
D	Cl	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

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

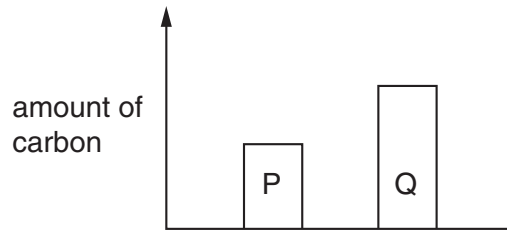
What is **X**?

- A calcium chloride
- B iron(II) sulphate
- C lead(II) nitrate
- D zinc sulphate

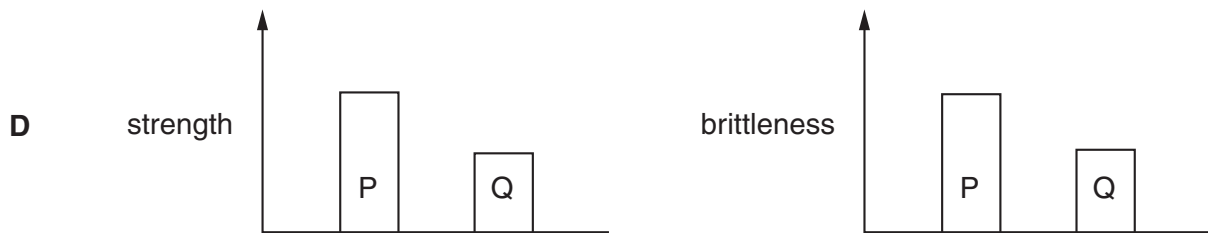
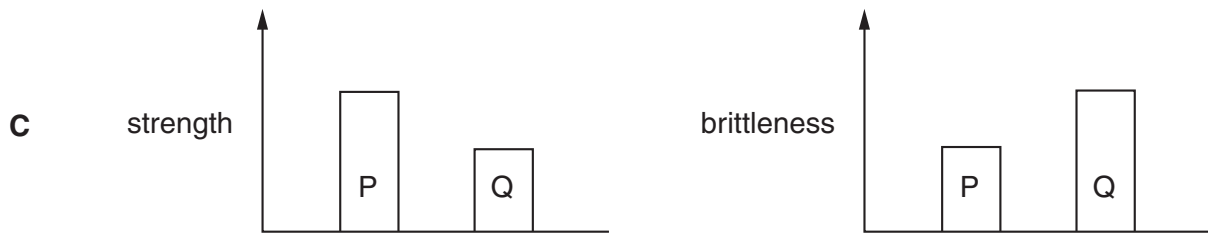
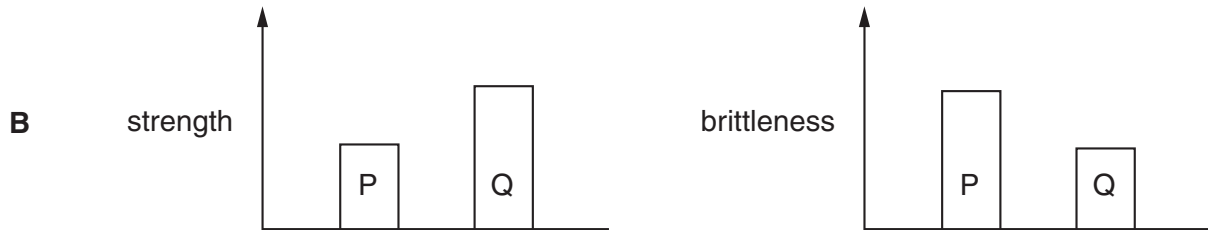
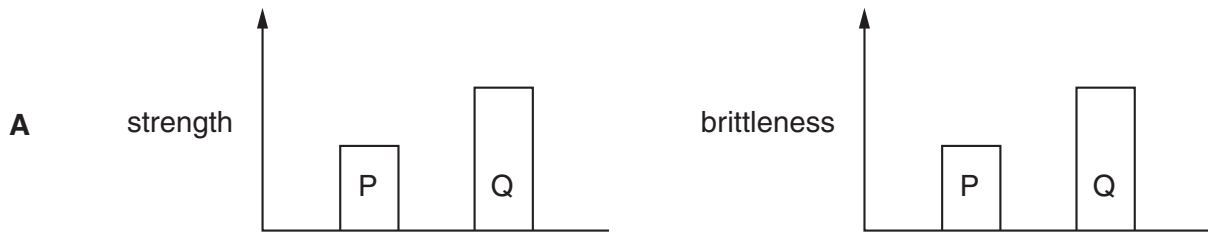
27 Why is cryolite, Na_3AlF_6 , used in the extraction of aluminium from aluminium oxide?

- 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?



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)?

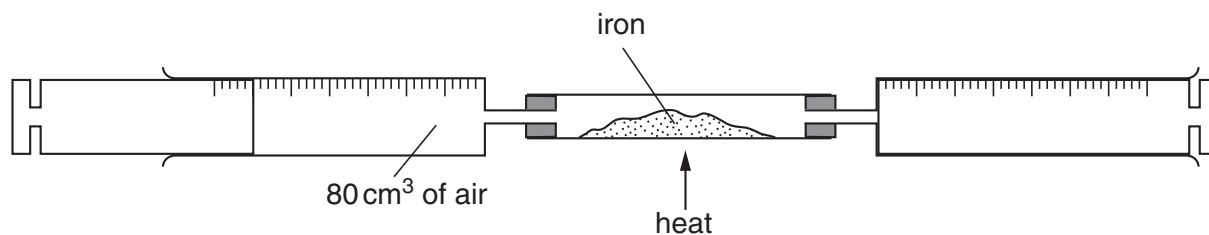
- A Mg Zn Fe Al
- B Fe Zn Al Mg
- C Mg Al Zn Fe
- D Mg Al Fe Zn

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 cm³ 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 cm³
- B 64 cm³
- C 20 cm³
- D 16 cm³

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)?

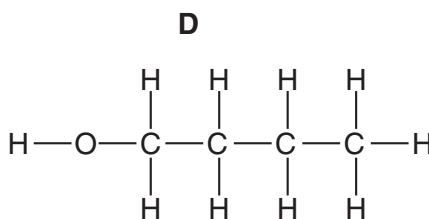
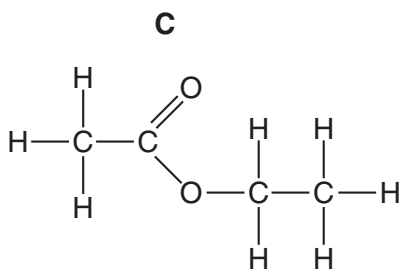
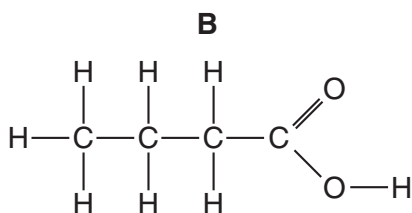
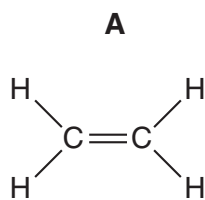
- A ethane
- B ethanoic acid
- C ethene
- D ethyl ethanoate

- 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?



- 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					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		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		65 Zn Zinc 30	64 Cu Copper 29	59 Ni Nickel 28	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	127 I Iodine 53	131 Xe Xenon 54
133 Cs Caesium 55	137 Ba Barium 56		204 Tl Thallium 81	197 Au Gold 79	195 Pt Platinum 78	192 Ir Iridium 77	201 Hg Mercury 80	207 Pb Lead 82	209 Bi Bismuth 83	212 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86
226 Ra Radium 88	227 Ac Actinium 89											
*58-71 Lanthanoid series												
†90-103 Actinoid series												
			162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71				
			159 Tb Terbium 65	157 Gd Gadolinium 64	152 Eu Europium 63	150 Sm Samarium 62	144 Nd Neodymium 60	141 Pr Praseodymium 59	140 Ce Cerium 58	137 Ba Barium 56	135 La Lanthanum 57	138 Ac Actinium 89
			98 Cf Californium 98	99 Es Einsteinium 99	100 Fm Fermium 100	101 Md Mendelevium 101	102 No Nobelium 102	103 Lr Lawrencium 103				
			97 Bk Berkelium 97	96 Cm Curium 96	95 Am Americium 95	94 Pu Plutonium 94	92 U Uranium 92	91 Pa Protactinium 91	90 Th Thorium 90	88 Ra Radium 88	87 Fr Francium 87	86 Rn Radon 86
			238 U Uranium 92	238 U Uranium 92	238 U Uranium 92	238 U Uranium 92	238 U Uranium 92	238 U Uranium 92	238 U Uranium 92	238 U Uranium 92	238 U Uranium 92	238 U Uranium 92

Key

a	X
b	X

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.).