

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.

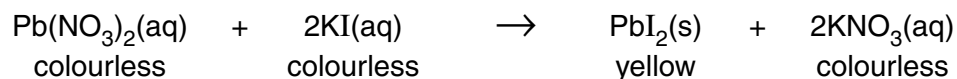
Any rough working should be done in this booklet.

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

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



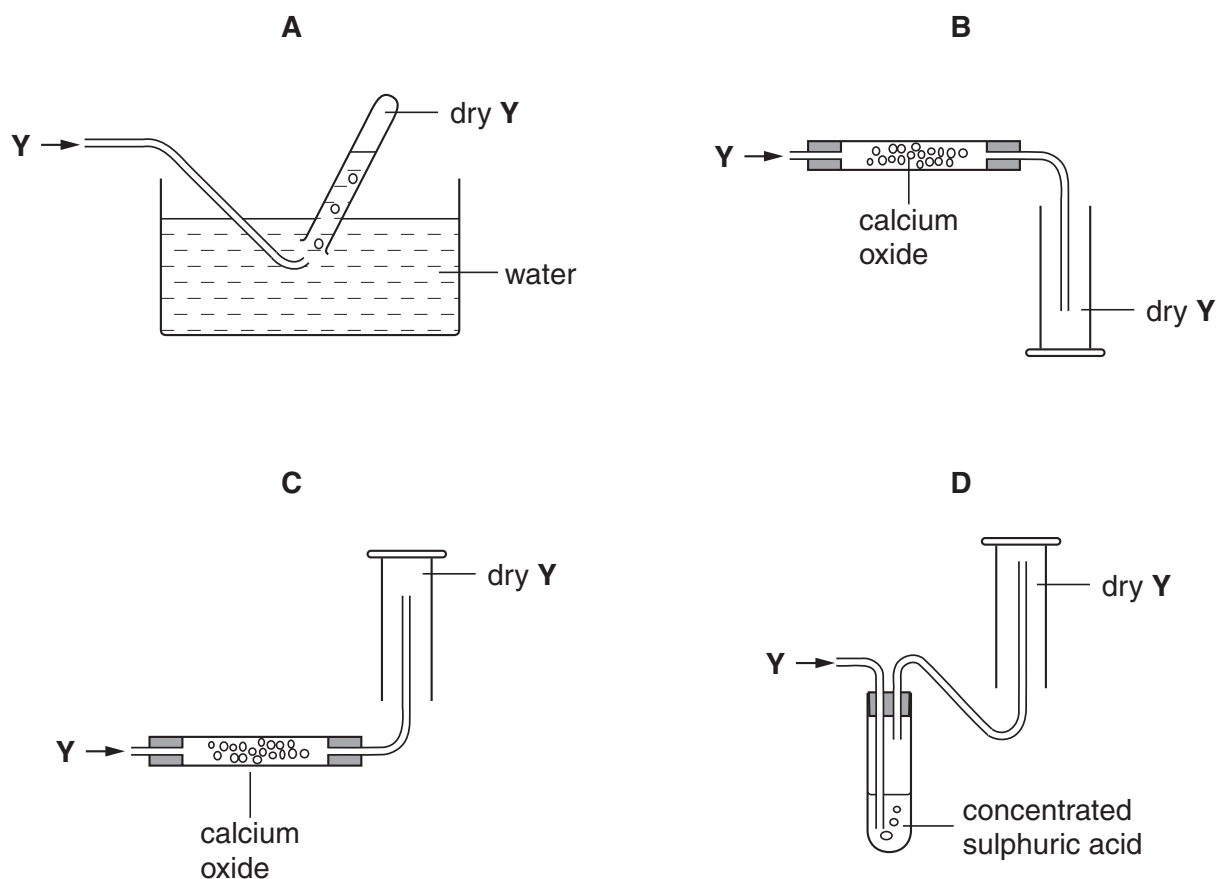
- 1 The equation for the reaction between aqueous lead(II) nitrate and aqueous potassium iodide is shown.



Which method could be used to separate the products?

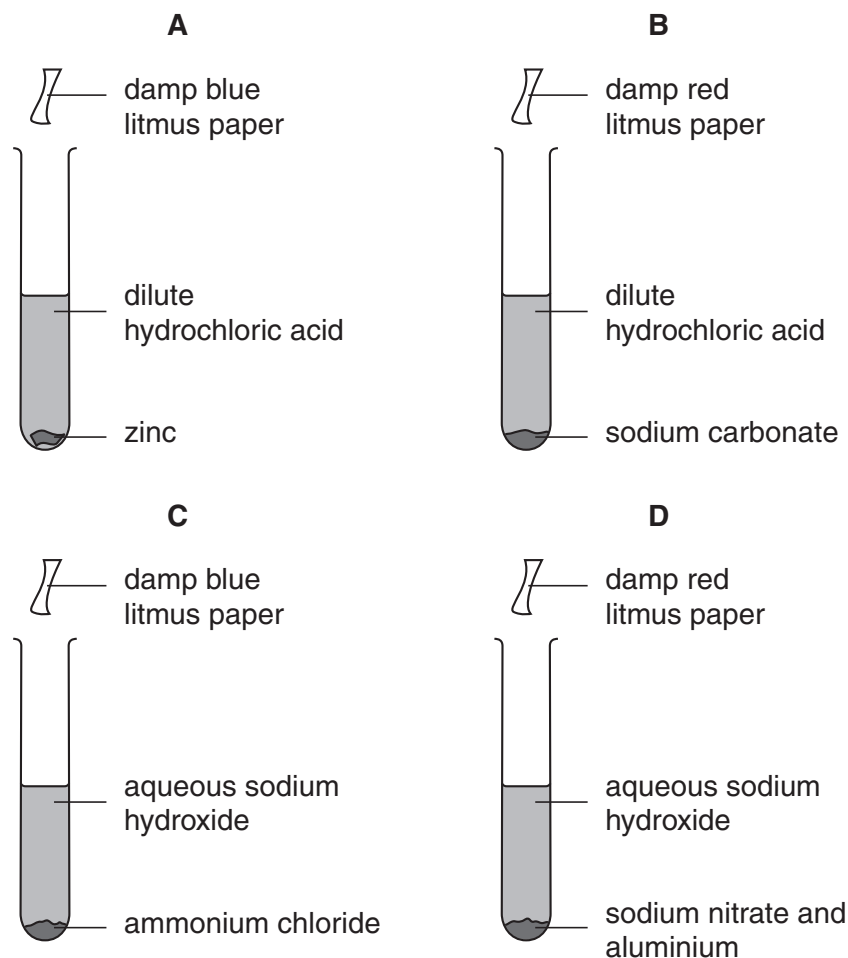
- A chromatography
 B crystallisation
 C distillation
 D filtration
- 2 A gas Y, is less dense than air, very soluble in water and is an alkali.

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?



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.

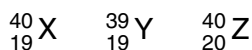
Where will the white solid form?



- 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?

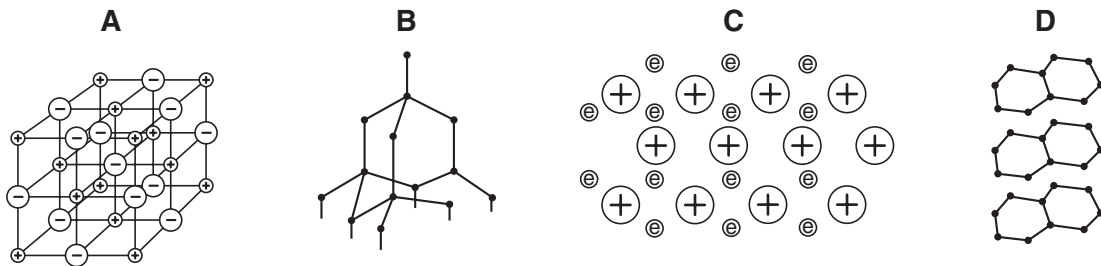
- A 0.25 mol/dm³
B 0.50 mol/dm³
C 1.00 mol/dm³
D 2.00 mol/dm³
- 6 For which of the following can graphite be used?
- A as an abrasive only
B as an abrasive and as an electrode
C as an electrode and as a lubricant
D as a lubricant only
- 7 The letters X, Y and Z represent different atoms.



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?

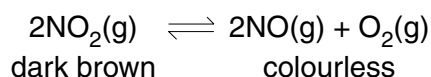
| | type of current | size of current | time |
|----------|-----------------|-----------------|-------|
| A | a.c. | low | short |
| B | d.c. | high | long |
| C | a.c. | high | short |
| D | d.c. | low | long |

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

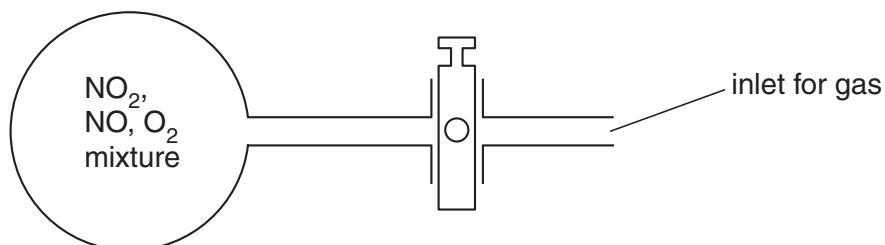
What is formed when concentrated aqueous rubidium chloride is electrolysed?

| 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.



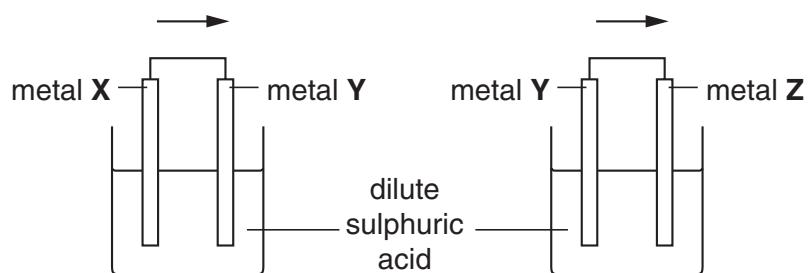
The diagram shows a glass flask containing a mixture of the three gases. The mixture is pale brown.



More oxygen is forced into the flask.

What colour change is seen in the mixture?

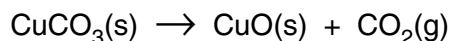
- A** there is no change
B it turns colourless
C it becomes darker brown
D it becomes a paler brown
- 17 Two cells were set up as shown in the diagram. The arrow shows the direction of electron flow in the external circuit.



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 |

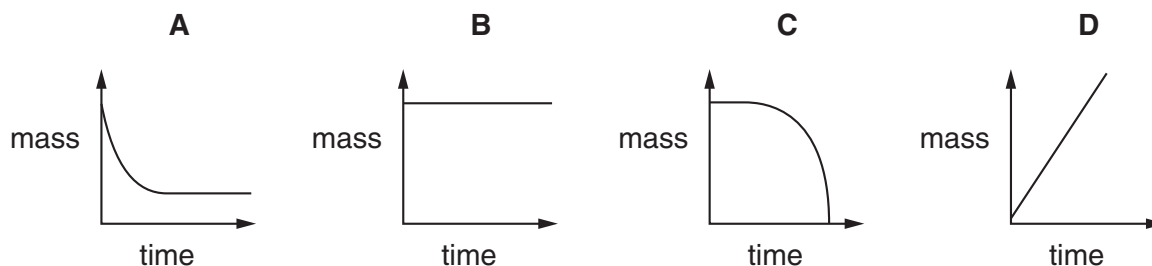
- 18 The equation shows the effect of heat on copper(II) carbonate.



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 |

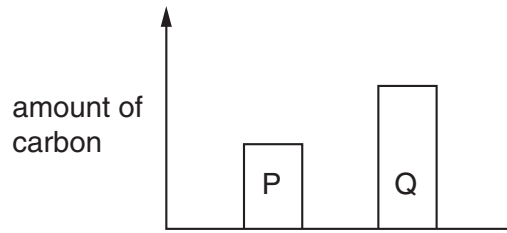
What is **X**?

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

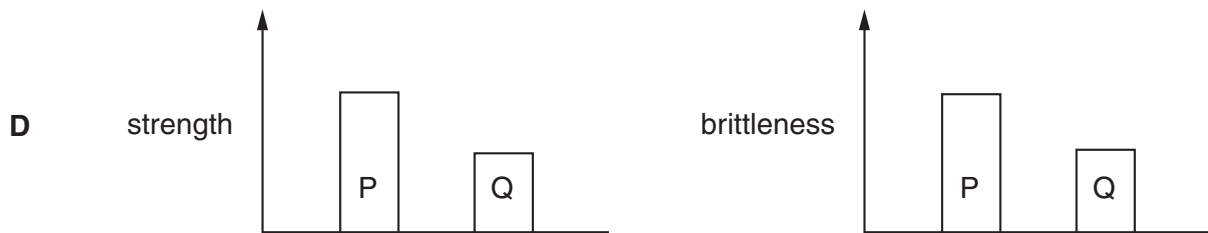
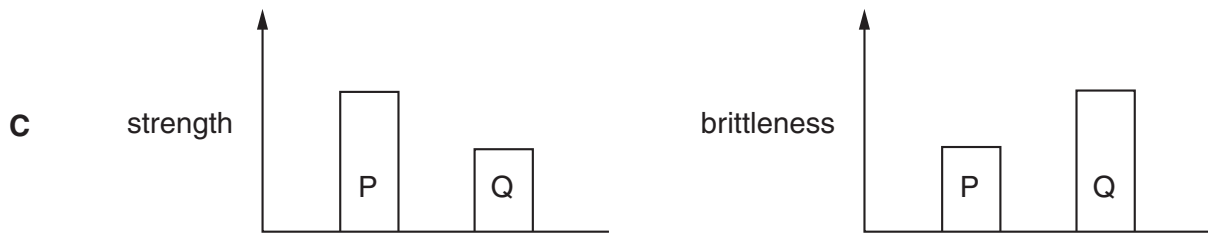
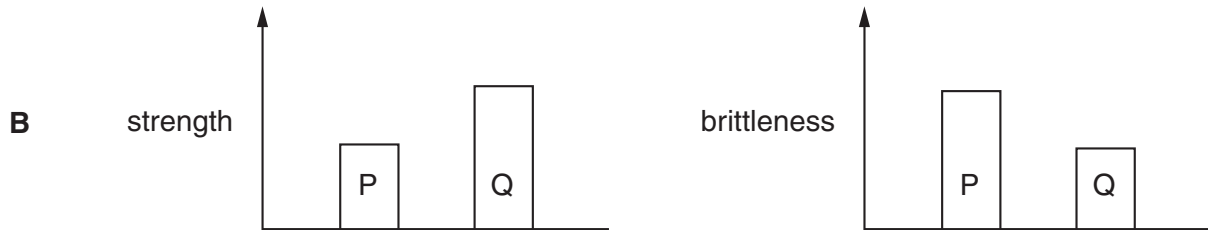
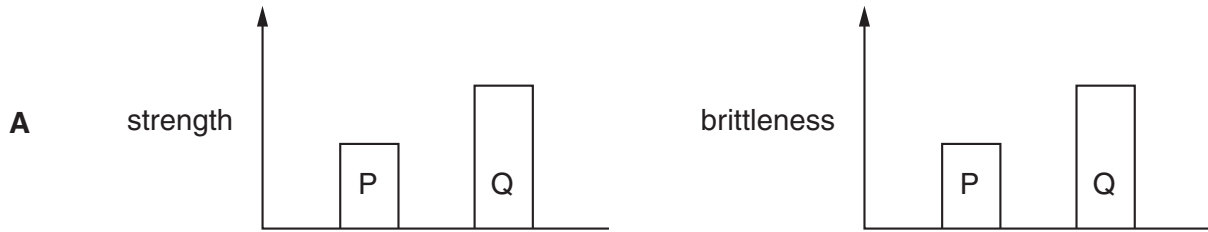
27 Why is cryolite, Na_3AlF_6 , used in the extraction of aluminium from aluminium oxide?

- 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)?

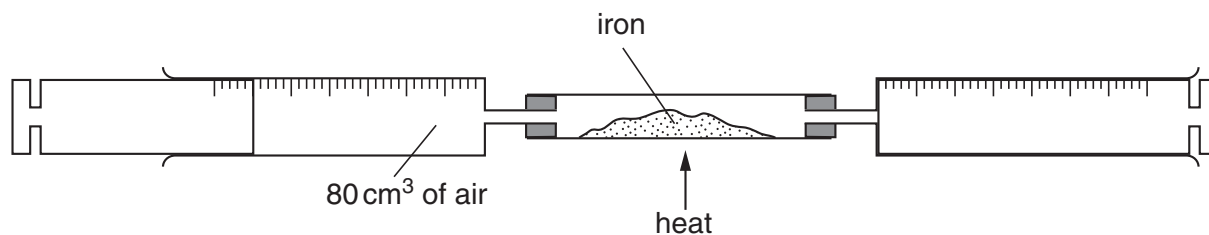
- A Mg Zn Fe Al
- B Fe Zn Al Mg
- C Mg Al Zn Fe
- D Mg Al Fe Zn

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)?

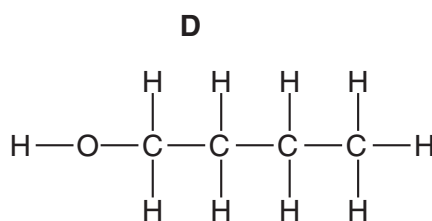
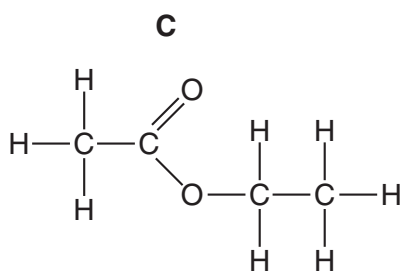
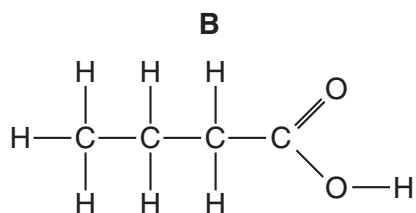
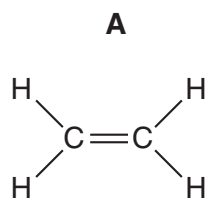
- A ethane
- B ethanoic acid
- C ethene
- D ethyl ethanoate

- 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 |
|-------|----|--------------------------------|------------------------------|-----|--------------------------------|--------------------------------|----------------------------------|---------------------------------|-------------------------------|
| | | 1 H Hydrogen 1 | | | | | | | 4 He Helium 2 |
| 3 | 4 | 7 Li Lithium | 9 Be Beryllium | | 6 B Boron | 7 N Nitrogen | 8 O Oxygen | 9 F Fluorine | 10 Ne Neon |
| 11 | 12 | 23 Na Sodium | 24 Mg Magnesium | | 13 Al Aluminium | 14 Si Silicon | 16 S Sulphur | 17 Cl Chlorine | 18 Ar Argon |
| 19 | 20 | 39 K Potassium | 40 Ca Calcium | | 31 Ga Gallium | 32 Ge Germanium | 34 Se Selenium | 35 Br Bromine | 36 Kr Krypton |
| 37 | 38 | 85 Rb Rubidium | 88 Sr Strontium | | 49 In Indium | 50 Sn Tin | 52 Te Tellurium | 53 I Iodine | 54 Xe Xenon |
| 55 | 56 | 133 Cs Caesium | 137 Ba Barium | | 81 Tl Thallium | 82 Pb Lead | 84 Po Polonium | 85 At Astatine | 86 Rn Radon |
| 87 | 88 | 226 Fr Francium | 226 Ra Radium | | 89 Ac Actinium † | | | | |
| | | | | | 27 Co Cobalt | 28 Ni Nickel | 29 Cu Copper | 30 Zn Zinc | |
| | | | | | 45 Sc Scandium | 46 Ti Titanium | 47 V Vanadium | 48 Cr Chromium | |
| | | | | | 72 Hf Hafnium | 73 Ta Tantalum | 74 W Tungsten | 75 Re Rhenium | |
| | | | | | 91 Zr Zirconium | 92 Nb Niobium | 93 Mo Molybdenum | 94 Tc Technetium | |
| | | | | | 106 Pd Palladium | 107 Ag Silver | 108 Cd Cadmium | 109 In Indium | |
| | | | | | 139 La Lanthanum | 140 Ce Cerium | 141 Pr Praseodymium | 142 Nd Neodymium | |
| | | | | | 157 Gd Gadolinium | 158 Tb Terbium | 159 Dy Dysprosium | 160 Ho Holmium | |
| | | | | | 209 Bi Bismuth | 210 Po Polonium | 211 At Astatine | 212 Rn Radon | |
| | | | | | 227 Ac Actinium † | | | | |
| | | | | | 167 Er Erbium | 168 Tm Thulium | 169 Yb Ytterbium | 170 Lu Lutetium | |
| | | | | | 98 Cf Californium | 99 Es Einsteinium | 100 Fm Fermium | 101 Md Mendelevium | |
| | | | | | 102 No Nobelium | 103 Lr Lawrencium | | | |

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

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.).