CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

**CHEMISTRY** **0620/01**

Paper 1 Multiple Choice

May/June 2003

**45 minutes**

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 20.

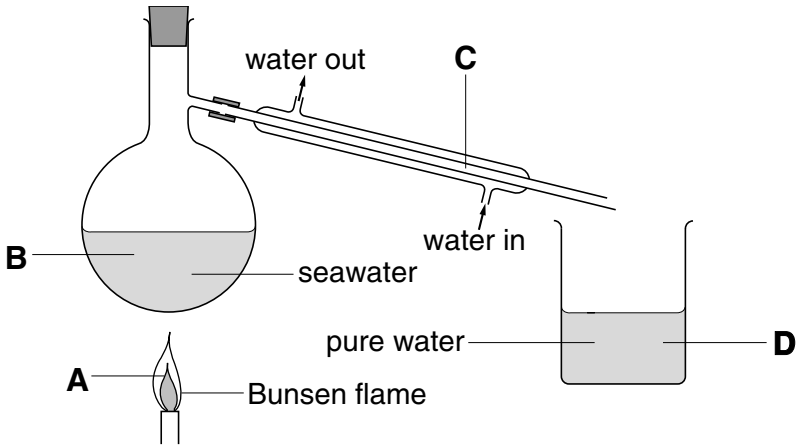
This document consists of **18** printed pages and **2** blank pages.

BR (PW) S41678/1

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate
**[Turn over**

**1** The diagram shows how to obtain pure water from seawater.

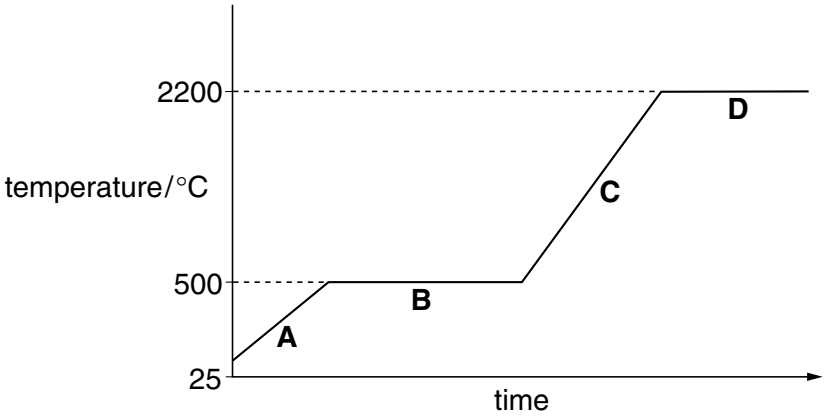
Where do water molecules lose energy?




**2** A solid metal is heated until it turns to vapour.

The graph shows the temperature of the metal during this process.

Which part of the graph shows the melting of the metal?




**3** Some chemical compounds are purified by recrystallisation.

What can be used to test the purity of the crystals?

**A** melting point

**B** colour of crystals

**C** size of crystals

**D** solubility

**4** What could be the melting point and boiling point of water containing a dissolved impurity?

| | melting point / °C | boiling point / °C |
|---|---|---|
| **A** | +3 | 96 |
| **B** | +3 | 104 |
| **C** | –3 | 96 |
| **D** | –3 | 104 |

**5** Which number in the table is –1?

| particle | charge | relative mass |
|---|---|---|
| electron | **A** | **B** |
| neutron | **C** | 1 |
| proton | **D** | 1 |

**6** What is the electronic structure of an atom with a proton number 5 and a nucleon number 11?

**A** 1, 8, 2 **B** 2, 8, 1 **C** 2, 3 **D** 3, 2

**7** What changes when an ion is made from an atom?

**A** the number of electrons only

**B** the number of neutrons only

**C** the number of protons only

**D** the number both of protons and of neutrons

**8** Strontium, Sr, is a metal that forms an ionic chloride $SrCl_2$.

Sulphur, S, is a non-metal that forms a covalent chloride $SCl_2$.

Which compound is likely to have the higher melting point (m.p.) and which is more soluble in water?

| | higher m.p. | more soluble in water |
|---|---|---|
| **A** | $SrCl_2$ | $SrCl_2$ |
| **B** | $SrCl_2$ | $SCl_2$ |
| **C** | $SCl_2$ | $SrCl_2$ |
| **D** | $SCl_2$ | $SCl_2$ |



**[Turn over**

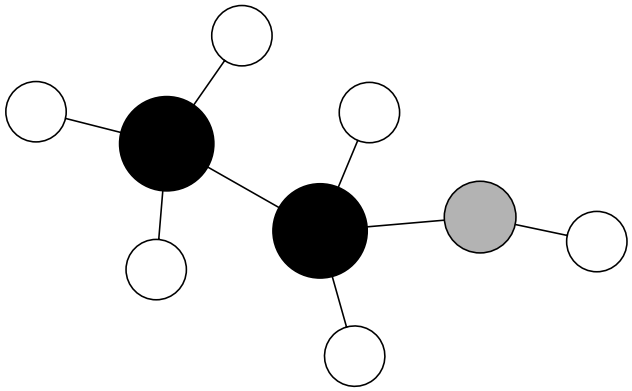
**9** The relative atomic mass of oxygen is 16 and that of hydrogen is 1.

This means that …(i)… of oxygen has the same mass as …(ii)… of hydrogen.

Which words correctly complete the gaps?

| | gap (i) | gap (ii) |
|---|---|---|
| **A** | an atom | thirty-two molecules |
| **B** | an atom | eight molecules |
| **C** | a molecule | sixteen atoms |
| **D** | a molecule | eight atoms |

**10** The diagram shows a model of a molecule containing carbon, hydrogen and oxygen.



How many atoms of each element are in the molecule?

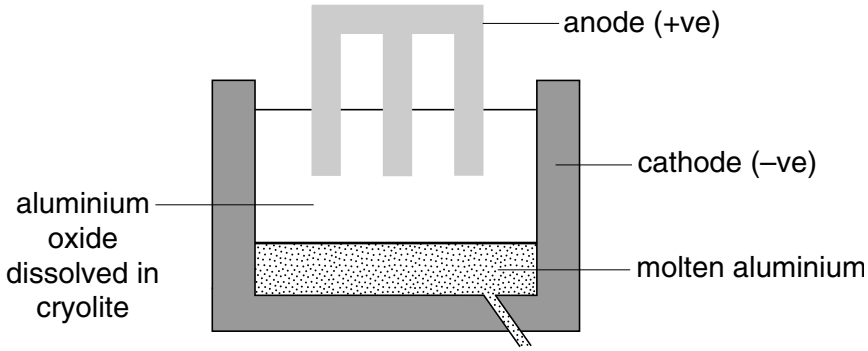
| | carbon | hydrogen | oxygen |
|---|---|---|---|
| **A** | 1 | 6 | 2 |
| **B** | 2 | 5 | 1 |
| **C** | 2 | 6 | 1 |
| **D** | 6 | 2 | 1 |

**11** Water is formed when 48 g of oxygen combine with 6 g of hydrogen.

What mass of oxygen combines with 2 g of hydrogen?

**A** 12 g **B** 16 g **C** 96 g **D** 144 g

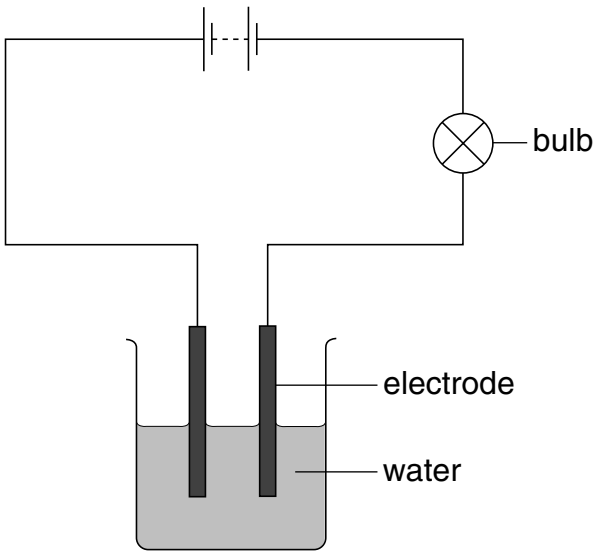
**12** The diagram shows how aluminium is manufactured by electrolysis.




What are the anode and cathode made of?

| | anode | cathode |
|---|---|---|
| **A** | aluminium | aluminium |
| **B** | aluminium | graphite |
| **C** | graphite | aluminium |
| **D** | graphite | graphite |

**13** A student sets up the apparatus shown. The bulb does not light.




After the student adds substance **X** to the water, the bulb lights.

What is **X**?

**A** calcium carbonate

**B** carbon

**C** copper(II) sulphate

**D** ethanol



**[Turn over**

**14** The following elements have radioactive isotopes.

Which element is used as a source of energy because of its radioactivity?

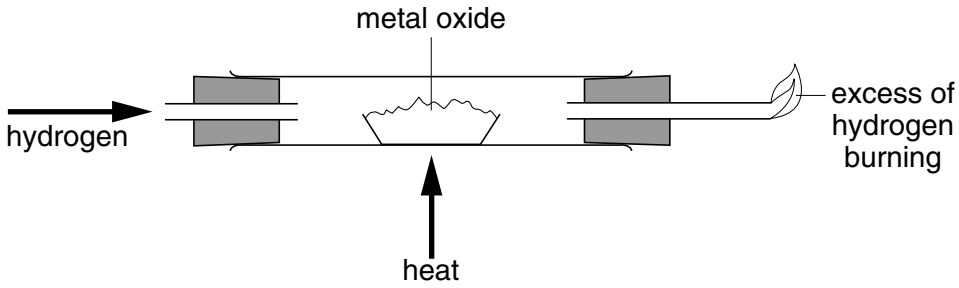
**A** carbon

**B** hydrogen

**C** iodine

**D** uranium

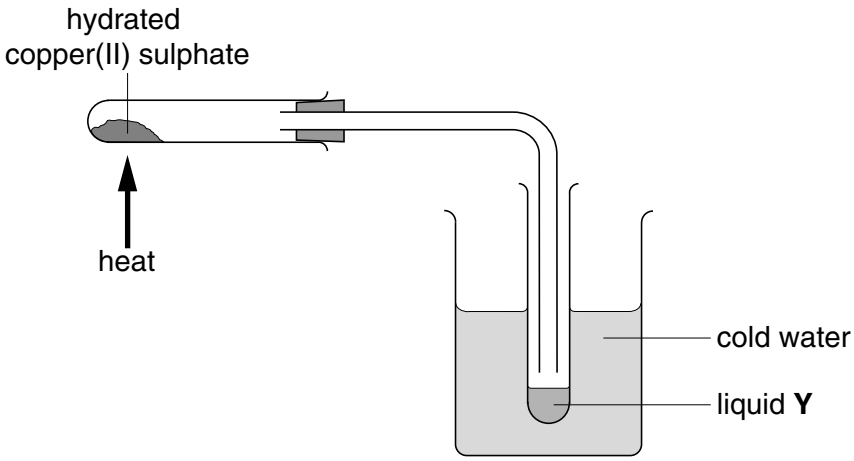
**15** When hydrogen is passed over a heated metal oxide, the metal and steam are formed.




What happens to the hydrogen and to the metal oxide?

| | hydrogen | metal oxide |
|---|---|---|
| **A** | oxidised | oxidised |
| **B** | oxidised | reduced |
| **C** | reduced | oxidised |
| **D** | reduced | reduced |

**16** When hydrated copper(II) sulphate is heated in the apparatus shown, solid **X** and liquid **Y** are produced.




Which changes are noticed when liquid **Y** is added to cold solid **X**?

| | colour change | heat change |
|---|---|---|
| **A** | blue to white | heat given out |
| **B** | blue to white | heat taken in |
| **C** | white to blue | heat given out |
| **D** | white to blue | heat taken in |

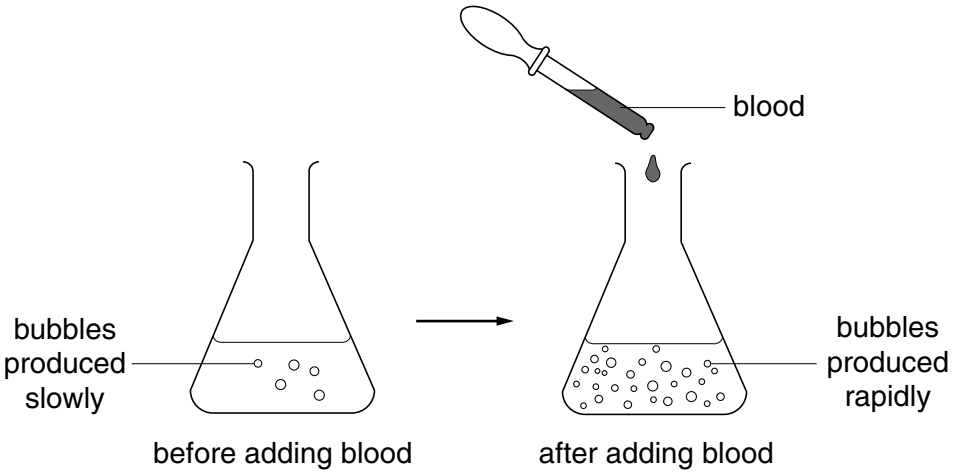


**[Turn over**

**17** A solution of hydrogen peroxide releases oxygen slowly at room temperature.

$$\text{hydrogen peroxide} \rightarrow \text{water} + \text{oxygen}$$

The diagrams show the effect of adding blood to the solution.




What could be the reason for the observed change?

**A** Blood contains an enzyme.

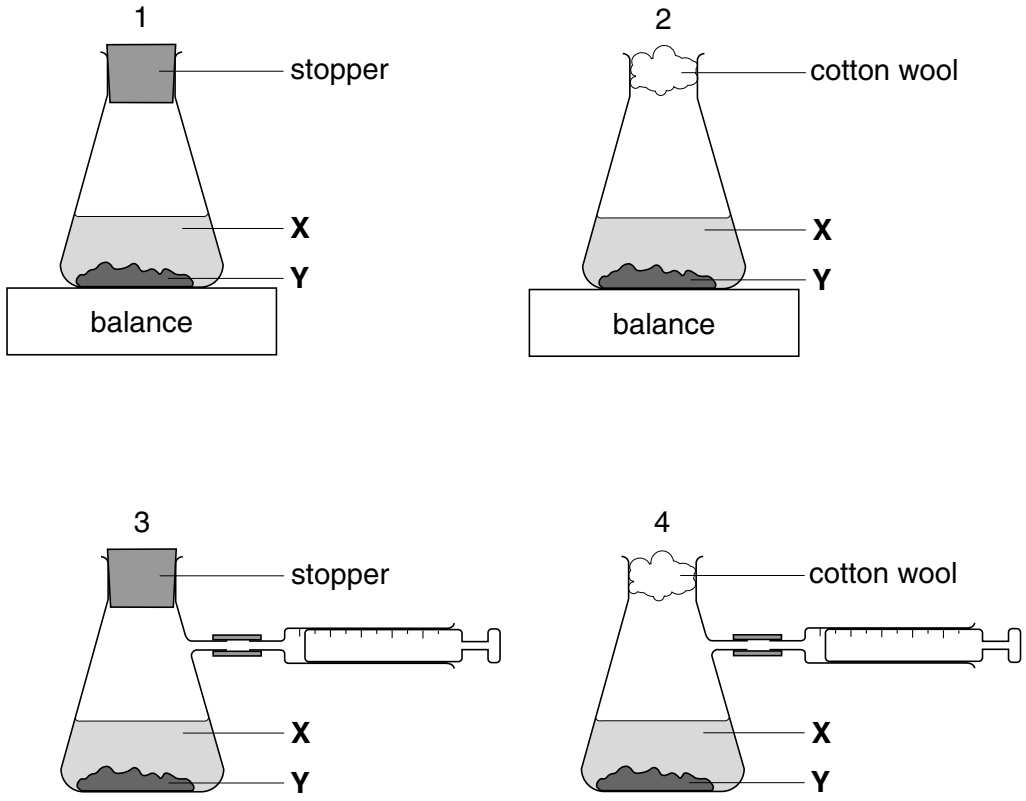
**B** Blood contains water.

**C** The hydrogen peroxide becomes more concentrated.

**D** The hydrogen peroxide is neutralised by blood.

**18** A liquid **X** reacts with solid **Y** to form a gas.

Which two diagrams show suitable methods for investigating the speed of the reaction?




**A** 1 and 3

**B** 1 and 4

**C** 2 and 3

**D** 2 and 4

**19** Which substance does **not** form copper(II) sulphate with warm, dilute sulphuric acid?

**A** copper

**B** copper(II) carbonate

**C** copper(II) hydroxide

**D** copper(II) oxide



**[Turn over**

**20** Which test method and gas are correctly linked?

| | test method | gas |
|---|---|---|
| **A** | a lighted splint | oxygen |
| **B** | a glowing splint | hydrogen |
| **C** | damp litmus paper | chlorine |
| **D** | limewater | ammonia |

**21** Water is added to a test-tube containing dilute sulphuric acid of pH 4.

What could be the pH of the resulting solution?

**A** 8 **B** 6 **C** 4 **D** 2

**22** Magnesium, on the left of Period Two of the Periodic Table, is more metallic than chlorine on the right of this Period.

Why is this?

Magnesium has

**A** fewer electrons.

**B** fewer protons.

**C** fewer full shells of electrons.

**D** fewer outermost electrons.

**23** An inert gas **X** is used to fill weather balloons.

Which descriptions of **X** are correct?

| | number of outer electrons in atoms of **X** | structure of gas **X** |
|---|---|---|
| **A** | 2 | single atoms |
| **B** | 2 | diatomic molecules |
| **C** | 8 | single atoms |
| **D** | 8 | diatomic molecules |

**24** A student is asked to complete two sentences.

Metallic and non-metallic elements are classified in the …(i)… This can be used to …(ii)… the properties of elements.

Which words correctly complete the gaps?

| | gap (i) | gap (ii) |
|---|---|---|
| **A** | Periodic Table | measure |
| **B** | Periodic Table | predict |
| **C** | reactivity series | measure |
| **D** | reactivity series | predict |

**25** Which material is an alloy that contains a non-metallic element?

**A** brass

**B** haematite

**C** manganese

**D** steel

**26** The table gives information about the reactivity of three metals P, Q and R.

| metal | reaction with air | reaction with steam | reaction with dilute hydrochloric acid |
|---|---|---|---|
| P | burns with sparks | forms an oxide | forms hydrogen |
| Q | slowly forms an oxide | no reaction | no reaction |
| R | slowly forms an oxide | no reaction | forms hydrogen |

What is the order of reactivity of P, Q and R?

| | most reactive ⟶ | | least reactive |
|---|---|---|---|
| **A** | P | Q | R |
| **B** | P | R | Q |
| **C** | Q | R | P |
| **D** | R | Q | P |



**[Turn over**

**27** The bodies of aircraft are often made using aluminium.

Which **two** properties of aluminium make it suitable for this purpose?

| | property 1 | property 2 |
|---|---|---|
| **A** | good conductor of electricity | good conductor of heat |
| **B** | good conductor of electricity | strong |
| **C** | good conductor of heat | low density |
| **D** | strong | low density |

**28** Which raw materials are used in the manufacture of iron?

**A** bauxite and lime

**B** bauxite and limestone

**C** haematite and lime

**D** haematite and limestone

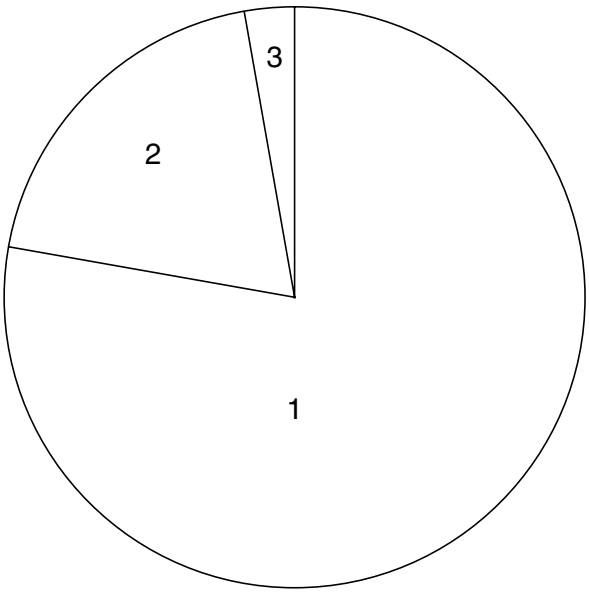
**29** In a car industry, approximately 45 000 litres of water are required to produce a single car.

This water does not need to be very pure.

Which purification methods would be suitable and economic to use?

| | chlorinated | distilled |
|---|---|---|
| **A** | ✓ | ✓ |
| **B** | ✓ | ✗ |
| **C** | ✗ | ✓ |
| **D** | ✗ | ✗ |

**30** The pie-chart shows the composition of air.




What are the gases in parts 1, 2 and 3 of the pie-chart?

| | 1 | 2 | 3 |
|---|---|---|---|
| **A** | nitrogen | other gases | oxygen |
| **B** | nitrogen | oxygen | other gases |
| **C** | oxygen | other gases | nitrogen |
| **D** | oxygen | nitrogen | other gases |

**31** A steel works and a chemical works are built near to a city. The limestone buildings in the city begin to crumble.

Which gas is most likely to cause this damage?

**A** carbon dioxide

**B** carbon monoxide

**C** oxygen

**D** sulphur dioxide

**32** Which methods can be used to prevent the rusting of an iron girder of a bridge?

| | coat it with grease | electroplate it | paint it |
|---|---|---|---|
| **A** | ✓ | ✓ | ✓ |
| **B** | ✓ | ✓ | ✗ |
| **C** | ✗ | ✓ | ✓ |
| **D** | ✗ | ✗ | ✓ |

**33** A student heats a mixture of ammonium chloride and calcium hydroxide. She tests the gas given off with damp red litmus paper.

What is the name of the gas and the final colour of the litmus paper?

| | gas | colour |
|---|---|---|
| **A** | ammonia | blue |
| **B** | ammonia | red |
| **C** | chlorine | red |
| **D** | chlorine | white |

**34** A newspaper article claims that carbon dioxide is formed as follows.

1 during respiration

2 when calcium carbonate reacts with hydrochloric acid

3 when methane burns in air

Which statements are correct?

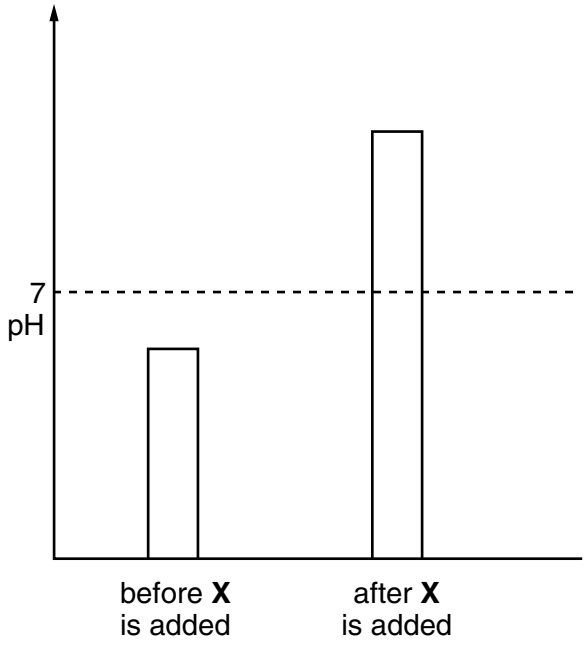
**A** 1, 2 and 3

**B** 1 and 2 only

**C** 1 and 3 only

**D** 2 and 3 only

**35** The diagram shows how the pH of an industrial waste changes when substance **X** is added to it.




What is substance **X**?

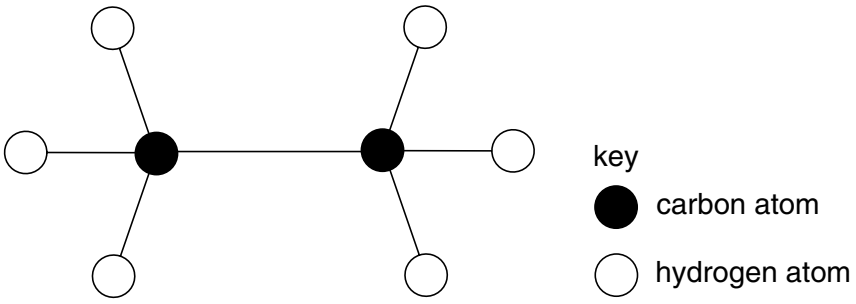
**A** coal

**B** lime

**C** salt

**D** water

**36** The diagram shows a model of an organic compound.




What is the name of this compound?

**A** ethane

**B** ethanoic acid

**C** ethanol

**D** ethene



**[Turn over**

**37** Bitumen is a substance obtained from the fractional distillation of petroleum.

What are the boiling points and the sizes of the molecules in bitumen?

| | boiling points | sizes of molecules |
|---|---|---|
| **A** | high | large |
| **B** | high | small |
| **C** | low | large |
| **D** | low | small |

**38** Which hydrocarbons in the table are members of the same homologous series?

| hydrocarbon | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| state at room temperature | gas | gas | liquid | liquid |
| reaction with oxygen | burns | burns | burns | burns |
| aqueous reaction with bromine | decolourises bromine | no reaction | decolourises bromine | no reaction |

**A** 1 and 2

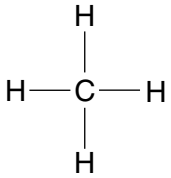
**B** 1 and 3

**C** 3 and 4

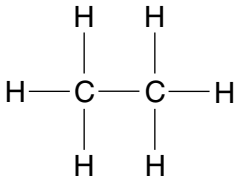
**D** 1, 2, 3 and 4

**39** Which of the molecules shown can be polymerised?

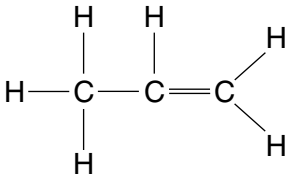
**A**



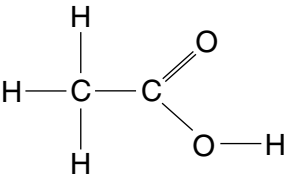
**B**



**C**



**D**



**40** Which conditions are necessary to ferment sugar into ethanol?

| | yeast | temperature/ °C |
|---|---|---|
| **A** | absent | 30 |
| **B** | absent | 70 |
| **C** | present | 30 |
| **D** | present | 70 |

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# 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 | Tc Technetium 43 | 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.).