UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

**SCIENCE (PHYSICS, CHEMISTRY)** **5124/01**

Paper 1 Multiple Choice

October/November 2005

**1 hour**

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

**READ THESE INSTRUCTIONS FIRST**

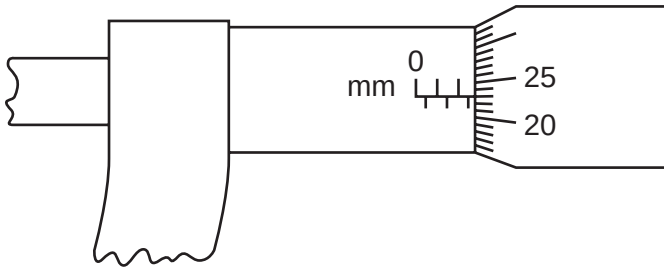
Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name, Centre number and candidate number on the answer sheet in the spaces provided unless this has been done for you.

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 20.

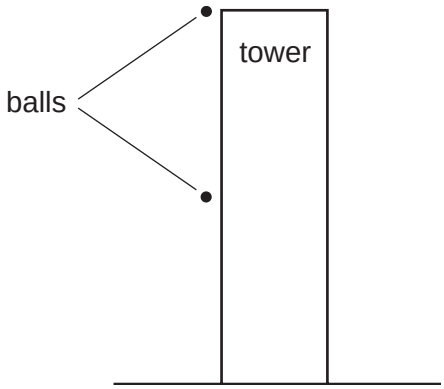
**1** The diagram shows a micrometer.




Which reading is shown?

**A** 2.23 mm **B** 2.73 mm **C** 3.23 mm **D** 5.23 mm

**2** Two identical balls are released from a tower at the same time. Initially at rest, one falls from the top of the tower and the other from half way.




Which quantity is the same for both balls?

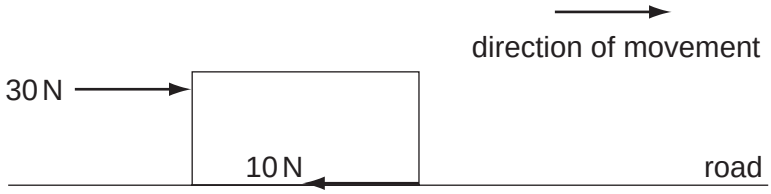
**A** acceleration

**B** final speed

**C** time of travel

**D** total increase in velocity

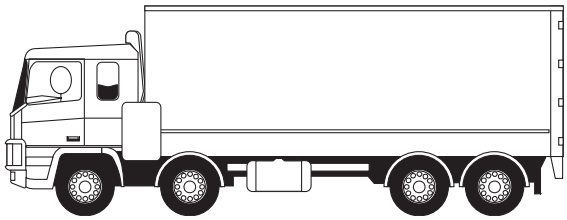
**3** A block of mass 20 kg is pushed along a road with a force of 30 N. The frictional force is 10 N.




What is the acceleration of the block?

**A** 0.67 m/s$^2$ **B** 1.0 m/s$^2$ **C** 1.5 m/s$^2$ **D** 2.0 m/s$^2$

**4** The diagram shows a lorry.



What is the best position for its centre of mass and why is it placed there?

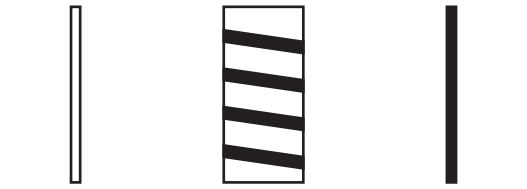
| | best position | reason for the position |
|---|---|---|
| **A** | as high as possible | the lorry can accelerate more rapidly |
| **B** | as high as possible | the lorry is more stable |
| **C** | as low as possible | the lorry can accelerate more rapidly |
| **D** | as low as possible | the lorry is more stable |

**5** A body moving with a speed of 30 m / s has a kinetic energy of 1800 J.

What is its mass?

**A** 120 kg **B** 60 kg **C** 4 kg **D** 2 kg

**6** Two identical metal plates are painted, one matt white and the other matt black. These are placed at equal distances from a radiant heater as shown. The heater is turned on for five minutes.

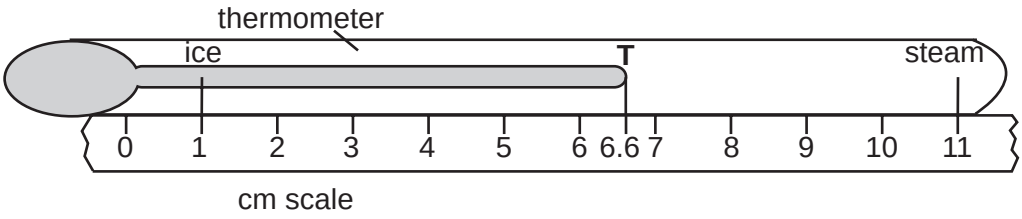



Which metal plate absorbs more energy and which plate emits more energy in this time?

| | absorbs more | emits more |
|---|---|---|
| **A** | black | black |
| **B** | black | white |
| **C** | white | black |
| **D** | white | white |

**7** A cm scale is fixed next to an unmarked mercury-in-glass thermometer.

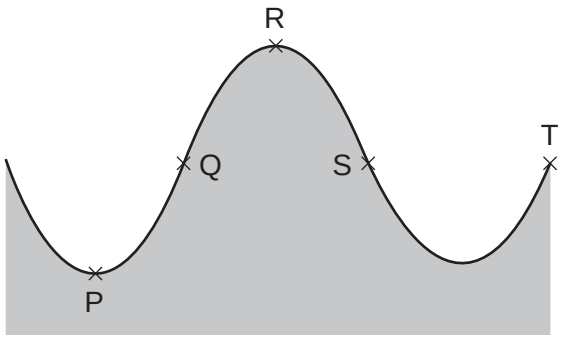
The ice point and the steam point are marked.




What is the temperature if the mercury is at **T**?

**A** 44 °C **B** 56 °C **C** 60 °C **D** 66 °C

**8** The diagram shows waves travelling on the sea.




Which points are one wavelength apart?

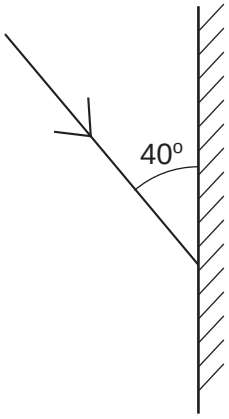
**A** P and R **B** Q and S **C** Q and T **D** S and T

**9** A surf-board moves at a speed of 5 m / s on the crest of a wave. The distance between successive wave crests is 10 m.

What is the frequency of the wave motion?

**A** 0.5 Hz **B** 2 Hz **C** 5 Hz **D** 10 Hz

**10** The diagram shows a single ray of light being directed at a plane mirror.




What are the angles of incidence and reflection?

| | angle of incidence | angle of reflection |
|---|---|---|
| **A** | 40° | 40° |
| **B** | 40° | 50° |
| **C** | 50° | 40° |
| **D** | 50° | 50° |

**11** What is the approximate range of audible frequencies for a young person?

**A** 1 Hz to 2 kHz

**B** 20 Hz to 20 kHz

**C** 20 kHz to 200 kHz

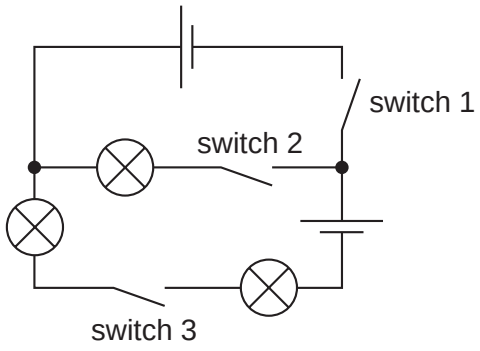
**D** 1000 kHz to 20 000 kHz

**12** A battery moves a charge of 60 C around a circuit in a time of 20 s.

What is the average current in the circuit?

**A** 0.3 A **B** 3.0 A **C** 40 A **D** 1200 A

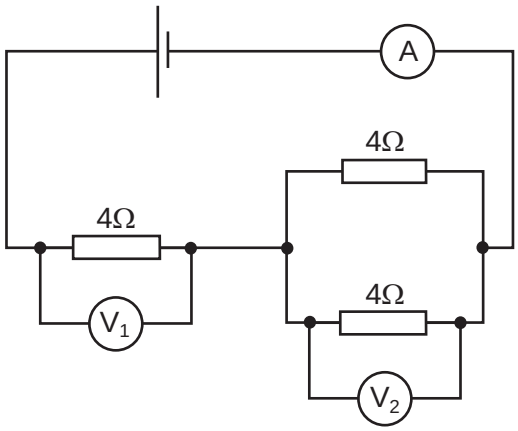
**13** A circuit is set up as shown.




Which switch setting lights all three lamps?

| | switch 1 | switch 2 | switch 3 |
|---|---|---|---|
| **A** | closed | closed | open |
| **B** | closed | open | closed |
| **C** | open | closed | closed |
| **D** | open | closed | open |

**14** In the circuit shown the reading on the ammeter is 1 A.




What would be the readings shown by the voltmeters $V_1$ and $V_2$?

| | $V_1$ | $V_2$ |
|---|---|---|
| **A** | 2 V | 2 V |
| **B** | 2 V | 4 V |
| **C** | 4 V | 4 V |
| **D** | 4 V | 2 V |

**15** A person uses a 3 kW electric fire for 2 hours and a 2 kW heater for 4 hours.

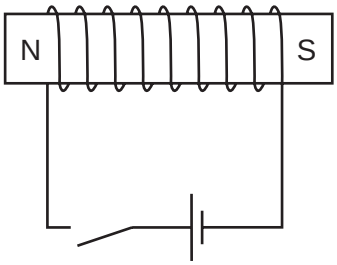
What is the total cost if the price of electrical energy is 5.0 cents per unit (kilowatt-hour)?

**A** 70 cents **B** 60 cents **C** 40 cents **D** 30 cents

**16** A permanent magnet can be demagnetised by using a solenoid and switching the current on then off.

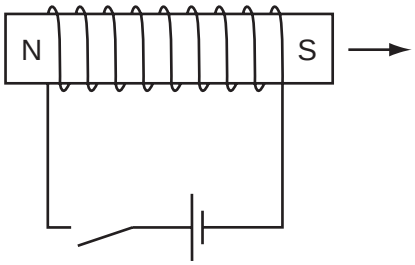
Which diagram shows the most effective method of producing demagnetisation?

**A**



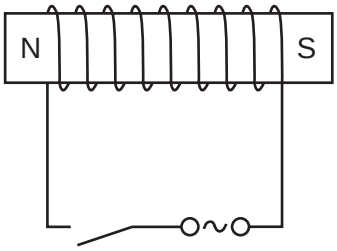

magnet left in place

**B**



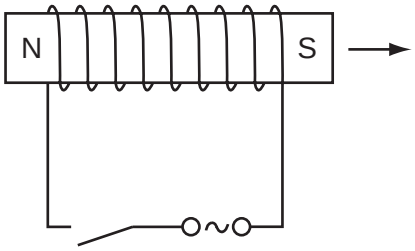

magnet withdrawn before switching off

**C**



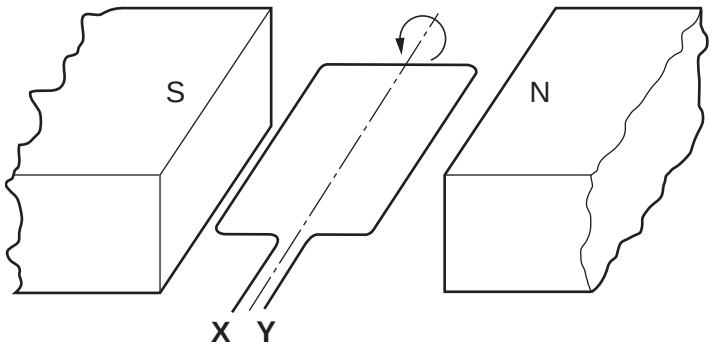

magnet left in place

**D**




magnet withdrawn before switching off

**17** The diagram shows a coil in a magnetic field.




When the coil is part of an a.c. generator, what must be connected directly to **X** and **Y**?

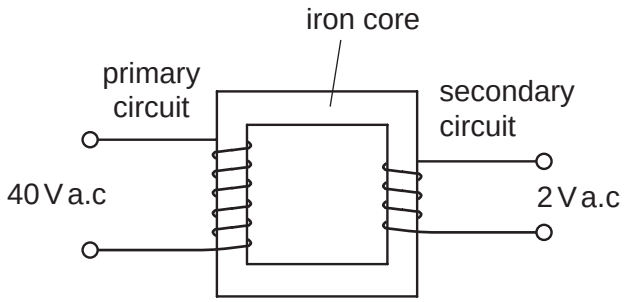
**A** a.c. supply

**B** carbon brushes

**C** slip rings

**D** soft-iron core

**18** The diagram shows a transformer which is 100 % efficient. The primary current is 0.5 A.




What will be the secondary current?

**A** 0.025 A **B** 0.5 A **C** 1 A **D** 10 A

**19** Which table correctly identifies the locations of protons, neutrons and electrons in an atom?

**A**

| | nucleus | |
|---|---|---|
| | inside | outside |
| electrons | ✓ | |
| neutrons | ✓ | |
| protons | | ✓ |

**B**

| | nucleus | |
|---|---|---|
| | inside | outside |
| electrons | | ✓ |
| neutrons | ✓ | |
| protons | ✓ | |

**C**

| | nucleus | |
|---|---|---|
| | inside | outside |
| electrons | ✓ | |
| neutrons | | ✓ |
| protons | | ✓ |

**D**

| | nucleus | |
|---|---|---|
| | inside | outside |
| electrons | | ✓ |
| neutrons | | ✓ |
| protons | ✓ | |

**20** A radioactive nucleus X, decays by emitting a beta-particle to form a nucleus, Y.

$$^{227}_{85}\text{X} = \text{Y} + \beta$$

What represents nucleus Y?

**A** $^{223}_{83}\text{Y}$ **B** $^{225}_{84}\text{Y}$ **C** $^{228}_{85}\text{Y}$ **D** $^{227}_{86}\text{Y}$

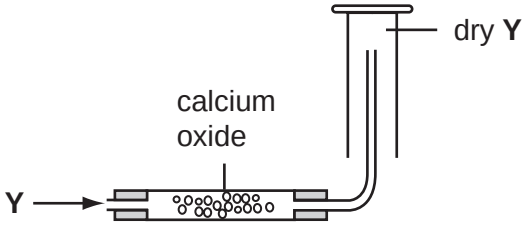


[Turn over

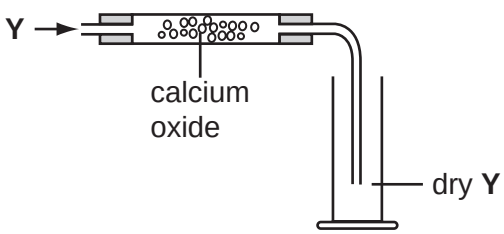
**21** A gas **Y**, is less dense than air, very soluble in water and is an alkali.

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

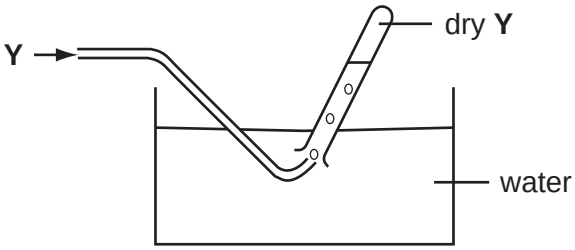
**A**



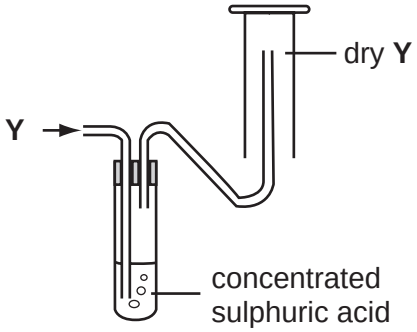

**B**




**C**




**D**




**22** Which changes occur when a liquid at 50 °C becomes a gas at 120 °C?

| | separation of particles | energy of particles | attractive force between particles |
|---|---|---|---|
| **A** | decreases | increases | decreases |
| **B** | decreases | decreases | increases |
| **C** | increases | increases | decreases |
| **D** | increases | decreases | increases |

**23** A nucleus is represented by the symbol $^{81}_{37}X$.

What does this nucleus contain?

**A** 37 electrons and 44 neutrons

**B** 37 neutrons and 81 protons

**C** 37 protons and 44 neutrons

**D** 37 protons and 81 neutrons

**24** Element X has an electronic structure 2.8.8.1.

Element Y has an electronic structure 2.8.6.

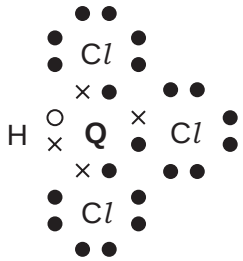
What is made when X and Y react?

| | type of compound | formula |
|---|---|---|
| **A** | covalent compound | $X_2Y$ |
| **B** | covalent compound | $XY_2$ |
| **C** | ionic compound | $X_2Y$ |
| **D** | ionic compound | $XY_2$ |

**25** Element **Q** has four electrons in its outermost shell.

Element **Q** can combine with hydrogen and chlorine to form a compound **Q**H$Cl_3$.

The diagram shows the electronic structure of **Q**H$Cl_3$ (outer shell electrons only).




Which of these properties will this compound have?

**A** It will be a solid at room temperature.

**B** It will be readily soluble in water.

**C** It will be a good conductor of electricity.

**D** It will have a low boiling point.

**26** Propane burns completely in oxygen as shown in the equation.

$$C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(l)$$

If 0.1 mol of propane is burnt completely, which volume of gaseous product is obtained, measured at room temperature and pressure?

**A** 0.1 $dm^3$ **B** 0.3 $dm^3$ **C** 2.4 $dm^3$ **D** 7.2 $dm^3$

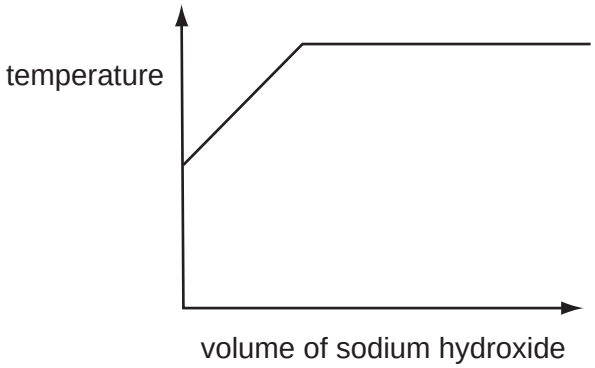


[Turn over

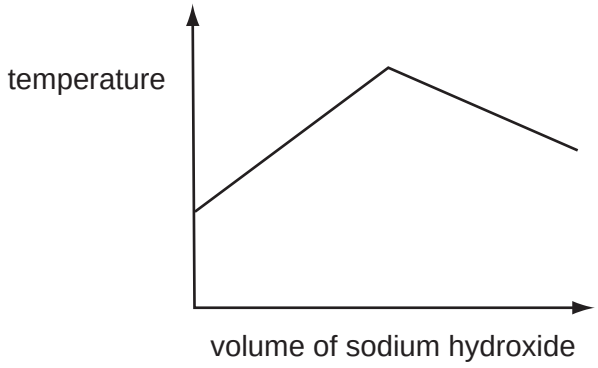
**27** The reaction between aqueous sodium hydroxide and hydrochloric acid is exothermic.

Which graph shows the change in temperature when aqueous sodium hydroxide is added to hydrochloric acid until the alkali is present in excess?

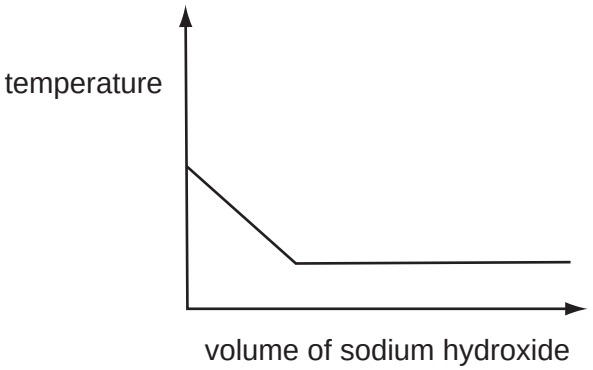
**A**



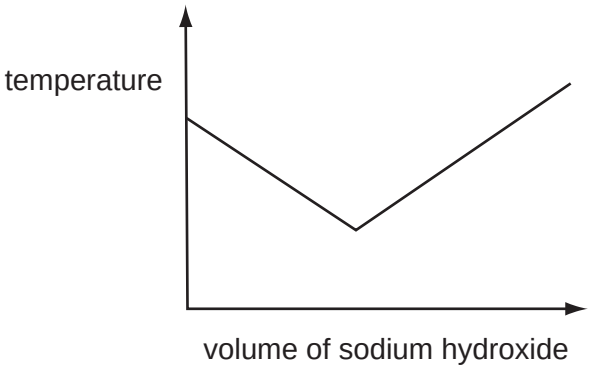

**B**



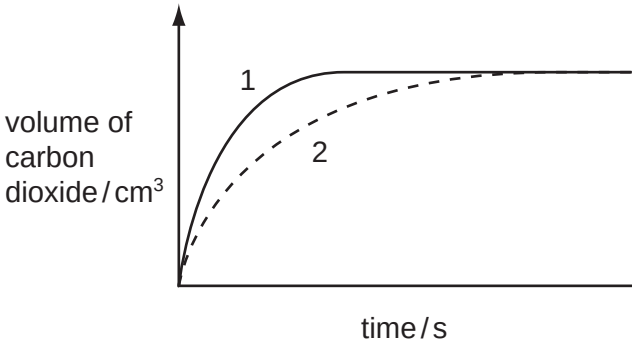

**C**




**D**




**28** Curve 1 shows the volume of carbon dioxide given off when 5 g of calcium carbonate lumps react completely with an excess of hydrochloric acid at 40 °C.




What change could produce curve 2?

**A** use a more concentrated solution of the acid

**B** use a lower temperature

**C** use 3 g of calcium carbonate lumps

**D** use 5 g of calcium carbonate powder

**29** Aqueous potassium sulphate can be prepared by titrating dilute sulphuric acid against aqueous potassium carbonate.

Which conclusion can be drawn from this information?

**A** Potassium carbonate is insoluble in water.

**B** Potassium carbonate neutralises sulphuric acid.

**C** Potassium sulphate is a base.

**D** Potassium sulphate is insoluble in water.

**30** The table shows the results of halogen displacement experiments.

| halogen added | halide solution | | |
|---|---|---|---|
| | $X^-$ | $Y^-$ | $Z^-$ |
| $X_2$ | – | $Y_2$ displaced | $Z_2$ displaced |
| $Y_2$ | no reaction | – | no reaction |
| $Z_2$ | 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 |

**31** The results of adding some metals to salt solutions are shown below.

copper + zinc sulphate → no reaction

magnesium + zinc sulphate → magnesium sulphate + zinc

copper + silver sulphate → copper(II) sulphate + silver

What is the order of reactivity of the metals?

| | most reactive ⟶ least reactive | | | |
|---|---|---|---|---|
| **A** | magnesium | copper | zinc | silver |
| **B** | magnesium | zinc | copper | silver |
| **C** | silver | copper | zinc | magnesium |
| **D** | zinc | magnesium | silver | copper |





[Turn over

**32** Which statement about the production of iron from haematite is correct?

**A** Coke is used to oxidise the slag.

**B** Limestone is used to produce oxygen for the coke to burn.

**C** Molten iron floats on slag at the furnace base.

**D** The haematite is reduced by carbon monoxide.

**33** Why is aluminium used to make food containers that are resistant to corrosion?

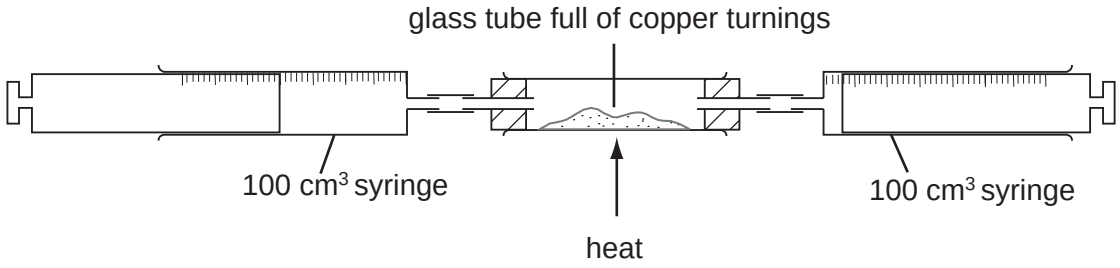
**A** It does not react with acids.

**B** It forms a covalent oxide.

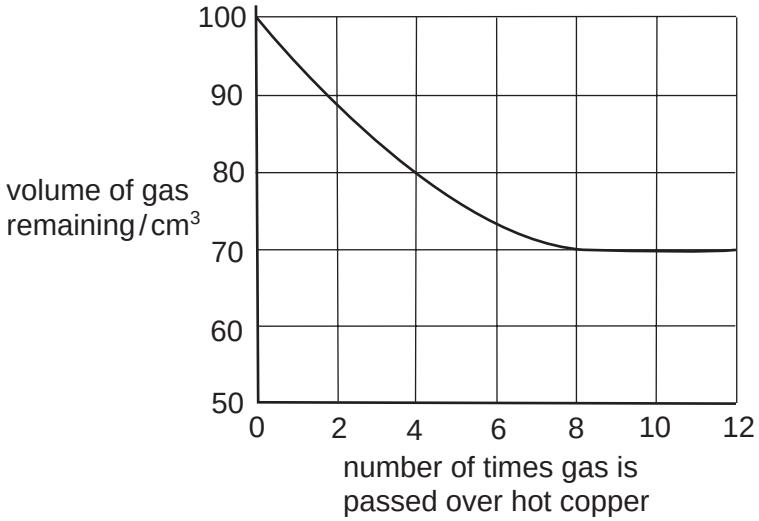
**C** It forms an alloy with zinc.

**D** It has a protective oxide layer on its surface.

**34** A 100 $cm^3$ sample of bottled gas used for diving was placed in a gas syringe in the apparatus shown.




The gas was passed backward and forward over heated copper turnings. The results obtained were used to plot the graph.




What is the percentage of oxygen in the bottled gas?

**A** 20 %  **B** 30 %  **C** 70 %  **D** 80 %

**35** All the members of a homologous series have the same

**A** empirical formula.

**B** general formula.

**C** molecular formula.

**D** physical properties.

**36** What does **not** happen in the complete combustion of propane, $C_3H_8$?

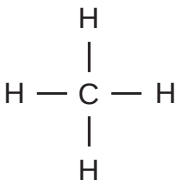
**A** a deposit of soot is formed

**B** carbon-carbon bonds break

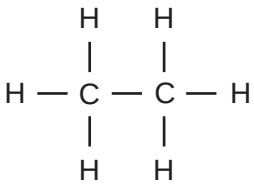
**C** carbon-oxygen bonds form

**D** energy is released

**37** The names and molecular structure of two alkanes are shown.



methane



ethane

What is the next alkane in the homologous series?

| | name | formula |
|---|---|---|
| **A** | butane | $C_3H_6$ |
| **B** | butane | $C_3H_8$ |
| **C** | propane | $C_3H_6$ |
| **D** | propane | $C_3H_8$ |

**38** Which compound will decolourise aqueous bromine?

**A** ethane

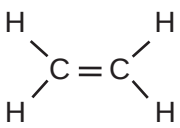
**B** ethanoic acid

**C** ethene

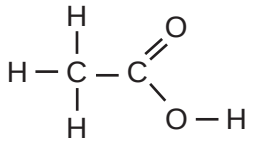
**D** poly(ethene)

**39** Which structure shows a compound that reacts with ethanol to give an ester?

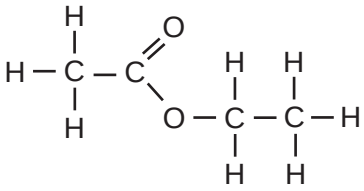
**A**



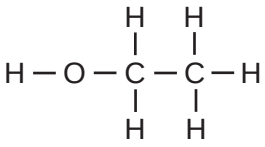
**B**



**C**



**D**



**40** Which of the following is a polyester?

**A** nylon

**B** poly(ethene)

**C** protein

**D** *Terylene*

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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 | | | | | | | | | | | | | | | |

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

Key

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

The volume of one mole of any gas is 24 $dm^3$ at room temperature and pressure (r.t.p.).