

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

**CHEMISTRY**

**0620/01**

Paper 1 Multiple Choice

May/June 2004

**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 16.

You may use a calculator.

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



## 2

- 1 Some students are asked to describe differences between gases and liquids.

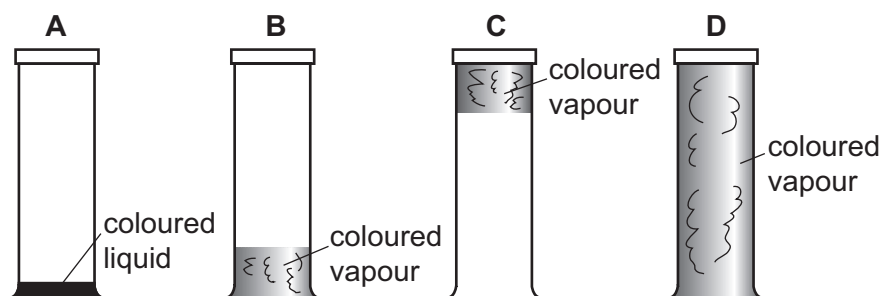
Three of their suggestions are:

1	gas molecules are further apart;
2	gas molecules are smaller;
3	liquid molecules vibrate around fixed positions.

Which suggestions are correct?

- A 1 only      B 2 only      C 3 only      D 1, 2 and 3
- 2 A coloured liquid vaporises easily at room temperature. Some of the liquid is placed at the bottom of a sealed gas jar.

Which diagram shows the appearance of the jar after several hours?



- 3 Measurements are made on some pure water.

its boiling point, b.p.  
its freezing point, f.p.  
its pH

Sodium chloride is now dissolved in the water and the measurements repeated.

Which measured values change?

	b.p.	f.p.	pH
<b>A</b>	✓	✓	✓
<b>B</b>	✓	✓	x
<b>C</b>	x	x	✓
<b>D</b>	x	x	x

## 3

- 4 The diagram shows a chromatogram obtained from three sweets, X, Y and Z.

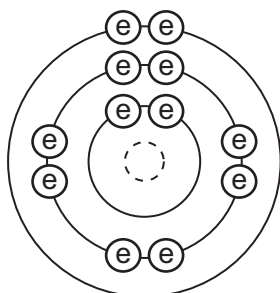
<ul style="list-style-type: none"> <li>● yellow</li> <li>● red</li> </ul>	<ul style="list-style-type: none"> <li>● red</li> <li>● yellow</li> </ul>	<ul style="list-style-type: none"> <li>● red</li> <li>● yellow</li> <li>● red</li> </ul>
sweet X	sweet Y	sweet Z

How many different red dyes are present in the sweets?

- A** 1                      **B** 2                      **C** 3                      **D** 4
- 5 Which properties does a Group VI element have?

	forms covalent bonds	forms ionic bonds	conducts electricity when solid
<b>A</b>	✓	✓	✓
<b>B</b>	x	✓	✓
<b>C</b>	✓	✓	x
<b>D</b>	✓	x	x

6 The electronic structure of an element is shown.



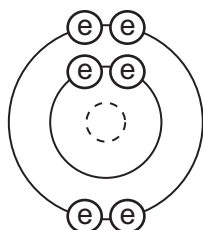
key

⊙ electron

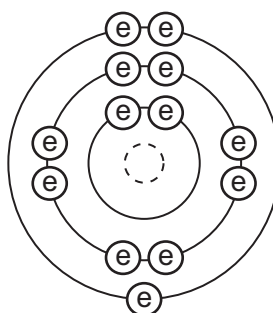
⊖ nucleus

Which diagram shows the electronic structure of another element in the same group in the Periodic Table?

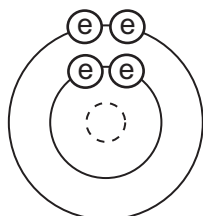
A



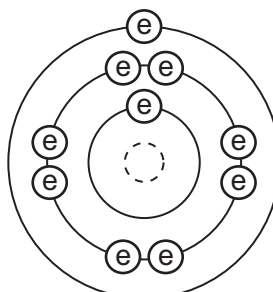
B



C



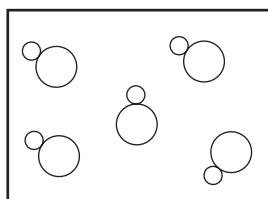
D



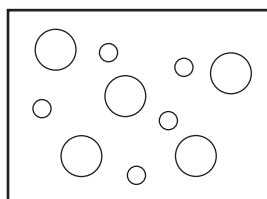
7 In the diagrams, circles of different sizes represent atoms of different elements.

Which diagram can represent hydrogen chloride gas?

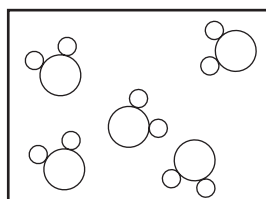
A



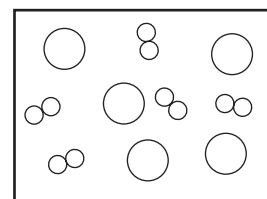
B



C



D



- 8 How many electrons are shared between the atoms in a molecule of methane, CH<sub>4</sub>, and in a molecule of water, H<sub>2</sub>O?

	methane	water
<b>A</b>	4	2
<b>B</b>	4	4
<b>C</b>	8	2
<b>D</b>	8	4

- 9 The oxide Pb<sub>3</sub>O<sub>4</sub> reacts with dilute nitric acid to form lead(II) nitrate, lead(IV) oxide and another product.

What is the equation for this reaction?

- A**  $\text{Pb}_3\text{O}_4 + 4\text{HNO}_3 \rightarrow 2\text{Pb}(\text{NO}_3)_2 + \text{PbO}_2 + 2\text{H}_2\text{O}$
- B**  $\text{Pb}_3\text{O}_4 + 2\text{HNO}_3 \rightarrow 2\text{PbNO}_3 + \text{PbO}_4 + \text{H}_2$
- C**  $\text{Pb}_3\text{O}_4 + 4\text{HNO}_3 \rightarrow \text{Pb}(\text{NO}_3)_4 + 2\text{PbO} + 2\text{H}_2\text{O}$
- D**  $2\text{Pb}_3\text{O}_4 + 2\text{HNO}_3 \rightarrow 2\text{Pb}_2\text{NO}_3 + 2\text{PbO}_2 + \text{H}_2$

- 10 The compound ethyl mercaptan, C<sub>2</sub>H<sub>5</sub>SH, has a very unpleasant smell.

What is its relative molecular mass?

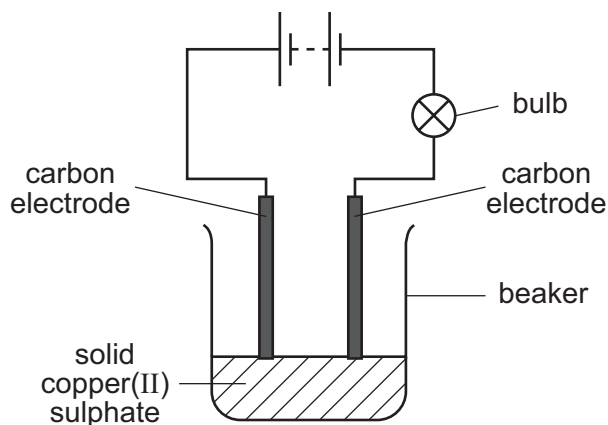
- A** 34                      **B** 50                      **C** 61                      **D** 62

- 11 The proton number of helium is 2.

What information does this give about helium?

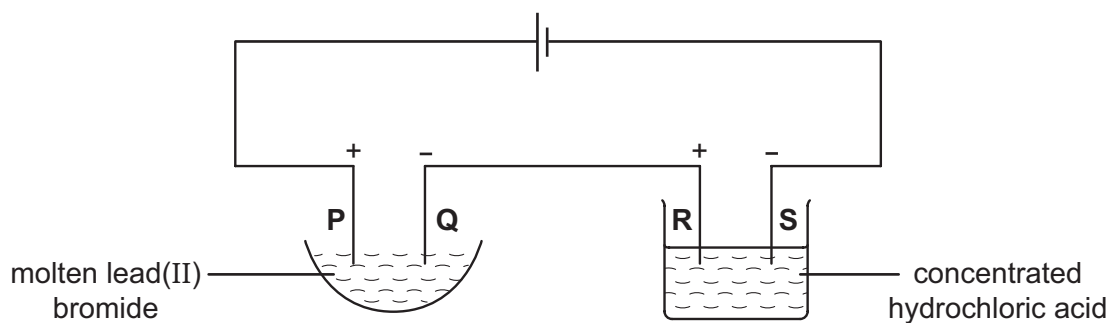
- A** Its atom has two electrons.
- B** Its atom is twice as heavy as a hydrogen atom.
- C** It is a Group II element.
- D** Its molecule has two atoms.

12 In the circuit shown the bulb does not light.



Which change would cause the bulb to light?

- A add more solid copper(II) sulphate to the beaker
  - B add water to dissolve the copper(II) sulphate
  - C replace the carbon electrodes with copper electrodes
  - D reverse the connections to the electrodes
- 13 The following electrolysis circuit is set up, using inert electrodes **P**, **Q**, **R** and **S**.



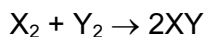
At which of the electrodes is a Group VII element produced?

- A P only
  - B P and R
  - C Q only
  - D Q and S
- 14 When it is used as a fuel, hydrogen combines with substance **X**.

What is **X**?

- A carbon
- B methane
- C nitrogen
- D oxygen

- 15 The table compares the strengths of the bonds for reactions of the type below.



Which reaction is most exothermic?

	bonds in $X_2$	bonds in $Y_2$	bonds in $XY$
<b>A</b>	strong	strong	strong
<b>B</b>	strong	strong	weak
<b>C</b>	weak	weak	strong
<b>D</b>	weak	weak	weak

- 16 In an experiment, copper(II) oxide is changed to copper by a gas **X**.

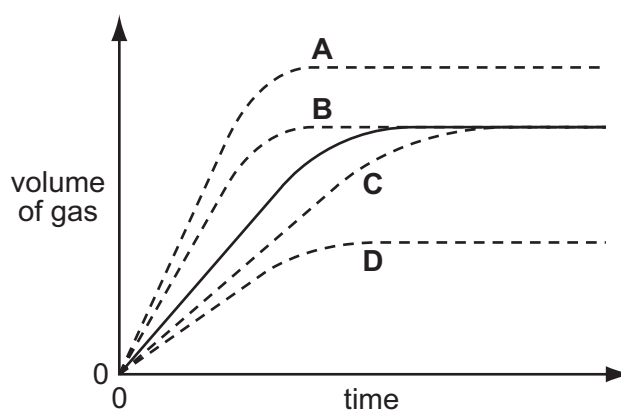
What happens to the copper(II) oxide and what is **X**?

	copper(II) oxide	gas <b>X</b>
<b>A</b>	oxidised	carbon dioxide
<b>B</b>	oxidised	carbon monoxide
<b>C</b>	reduced	carbon dioxide
<b>D</b>	reduced	carbon monoxide

- 17 In an experiment, a 2g lump of zinc and 2g of powdered zinc are added separately to equal volumes of dilute sulphuric acid.

The solid line on the graph shows the volume of gas given off when the 2g lump is used.

Which dotted line is obtained when the zinc is powdered?



18 Which process is endothermic?

- A adding water to anhydrous copper(II) sulphate
- B burning magnesium to make the oxide
- C heating water to make steam
- D neutralising acidic industrial waste

19 An aqueous solution contains either aluminium sulphate or zinc sulphate.

Which aqueous reagent can be used to confirm which salt is present?

- A ammonia
- B barium chloride
- C sodium hydroxide
- D sulphuric acid



20 Compound **X**

- does not dissolve in water,
- does not react with water,
- is used to control soil acidity.

What is **X**?

- A calcium carbonate
- B calcium chloride
- C calcium hydroxide
- D calcium oxide

21 Aqueous sodium hydroxide is added to two different solutions with the results shown.

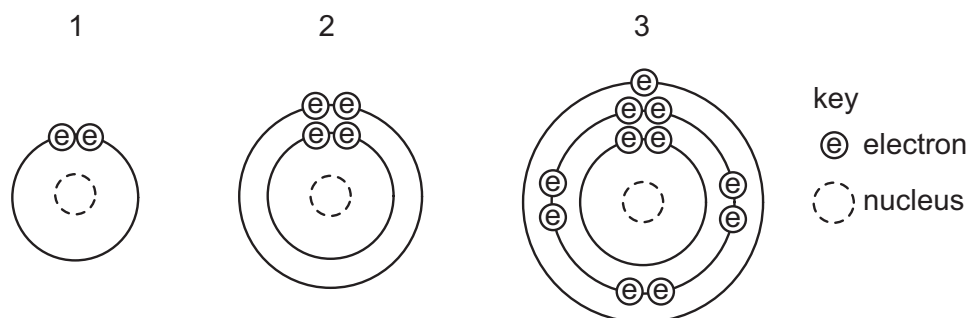
green precipitate formed

X

light blue precipitate formed

Which cation is present in **X** and in **Y**?

	<b>X</b>	<b>Y</b>
<b>A</b>	ammonium	iron(II)
<b>B</b>	copper(II)	ammonium
<b>C</b>	iron(II)	copper(II)
<b>D</b>	iron(II)	ammonium



22 The diagrams show the arrangement of electrons in three different atoms.



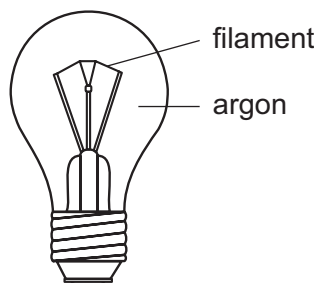
Which atoms are metals?

- A** 1 and 2 only    **B** 1 and 3 only    **C** 2 and 3 only    **D** 1, 2 and 3

23 Which property do all metals have?

- A** They are hard.  
**B** They conduct electricity.  
**C** They form acidic oxides.  
**D** They react with water.

24 The diagram shows a light bulb.



Why is argon used instead of air in the light bulb?

- A** Argon is a good conductor of electricity.  
**B** Argon is more reactive than air.  
**C** The filament glows more brightly.  
**D** The filament lasts for a longer time.

25 Which element is likely to be a transition metal?

	melting point in °C	density in g/cm <sup>3</sup>	colour of oxide
<b>A</b>	98	1.0	white
<b>B</b>	328	11.3	yellow
<b>C</b>	651	1.7	white
<b>D</b>	1240	7.4	black

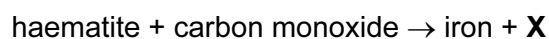
26 Three metals are extracted as shown in the table.

metal	method of extraction
X	electrolyse molten metal oxide
Y	heat metal oxide with carbon
Z	occurs naturally as the metal

What is the order of reactivity of the metals?

	most reactive	—————>	least reactive
<b>A</b>	X	Y	Z
<b>B</b>	X	Z	Y
<b>C</b>	Y	Z	X
<b>D</b>	Z	X	Y

27 Haematite is reduced to iron in the blast furnace.



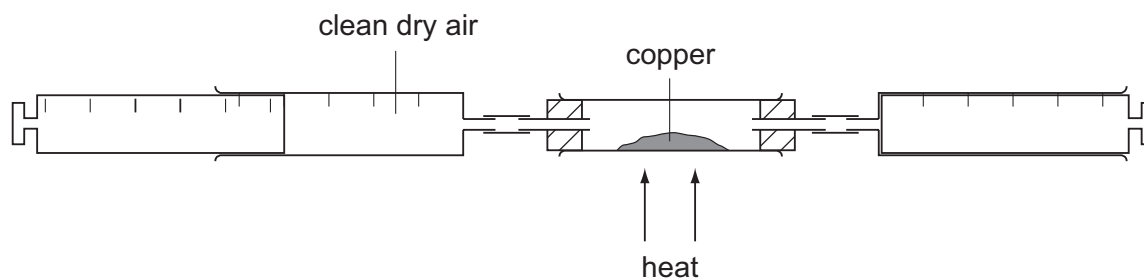
What is **X**?

- A** carbon
- B** carbon dioxide
- C** hydrogen
- D** oxygen

28 Which object is **least** likely to contain aluminium?

- A** a bicycle frame
- B** a hammer
- C** a saucepan
- D** an aeroplane body

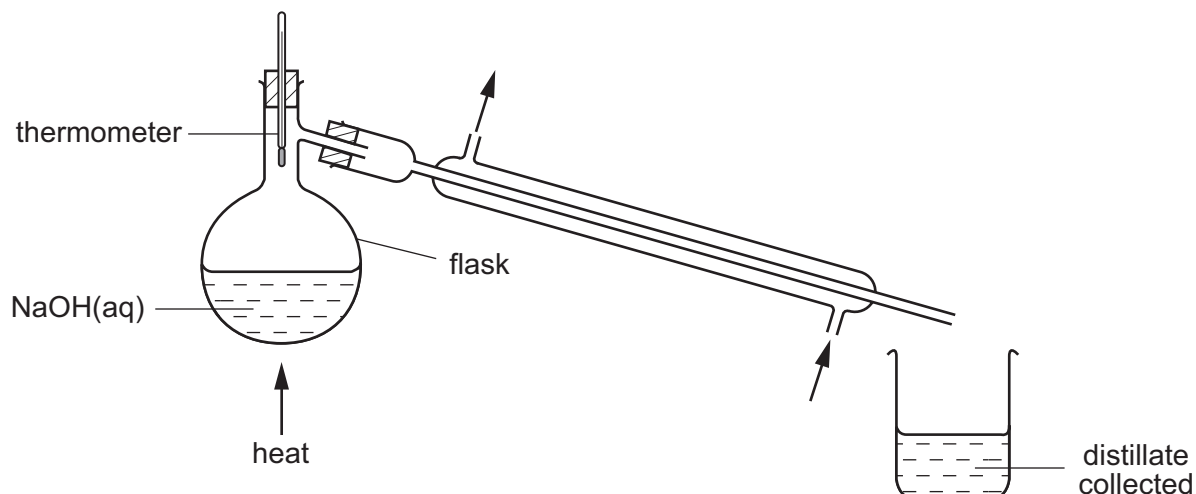
- 29 A sample of clean, dry air is passed over hot copper until **all** the oxygen in the air reacts with the copper.



The volume of air decreases by  $30 \text{ cm}^3$ .

What was the starting volume of the sample of air?

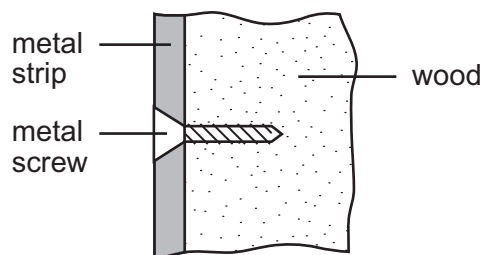
- A  $60 \text{ cm}^3$       B  $100 \text{ cm}^3$       C  $150 \text{ cm}^3$       D  $300 \text{ cm}^3$
- 30 The pH of some aqueous sodium hydroxide is measured. The solution is then distilled as shown.



How do the pH values of the distillate and of the solution left in the flask compare with the original?

	pH of the distillate	pH of the solution left in the flask
<b>A</b>	higher	higher
<b>B</b>	higher	lower
<b>C</b>	lower	higher
<b>D</b>	lower	lower

- 31 Which two gases produced from the burning of petrol in motor vehicles contribute to the formation of acid rain?
- A** carbon dioxide and carbon monoxide  
**B** carbon monoxide and sulphur dioxide  
**C** carbon monoxide and nitrogen dioxide  
**D** nitrogen dioxide and sulphur dioxide
- 32 An old railway carriage is being restored. Metal strips are secured on to the outside of the wooden carriage by means of screws. After a few weeks open to the wind and rain, the screws are heavily corroded but the metal strips are not.

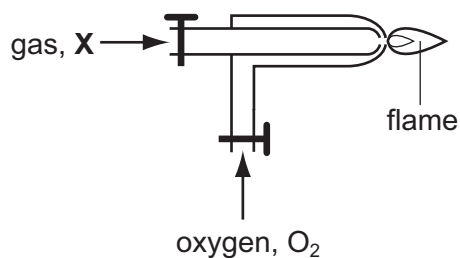


Aluminium is more reactive than both steel and copper.

Which two metals would give this result?

	screws	strips
<b>A</b>	aluminium	steel
<b>B</b>	copper	aluminium
<b>C</b>	copper	steel
<b>D</b>	steel	aluminium

- 33 The diagram shows how oxygen is used in welding.



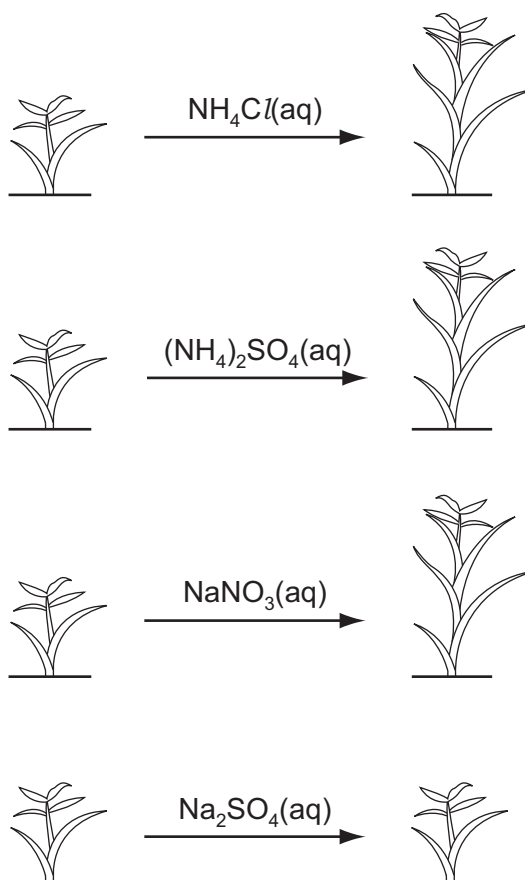
What is gas **X**?

- A** acetylene  
**B** argon  
**C** neon  
**D** nitrogen

34 The diagrams show the growth of four plants.

before treatment

after treatment



Which element is acting as a fertiliser?

**A** Cl

**B** N

**C** Na

**D** S

35 Gas is released in all of the examples below.



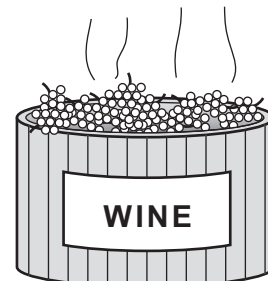
acid rain on a limestone statue



a candle burning



a dog panting



fermenting grapes

Which gas do they **all** produce?

- A carbon dioxide
- B hydrogen
- C methane
- D oxygen

36 What is formed when calcium carbonate is heated?

- A calcium and carbon
- B calcium and carbon dioxide
- C calcium oxide and carbon
- D calcium oxide and carbon dioxide

37 Which compound contains three elements?

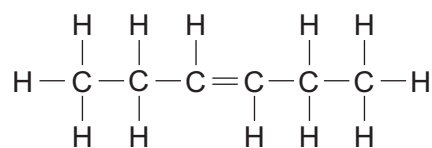
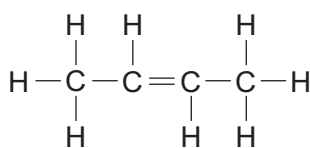
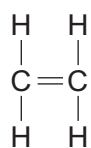
- A ethanol
- B ethene
- C methane
- D poly(ethene)

38 Four fractions obtained from crude oil (petroleum) are listed below.

Which fraction is paired with a correct use?

	fraction	use
<b>A</b>	bitumen	making waxes
<b>B</b>	diesel	fuel for aircraft
<b>C</b>	lubricating	making roads
<b>D</b>	paraffin	fuel for oil stoves

39 The structures of three compounds are shown.



Why do these substances all belong to the same homologous series?

- A** They all contain an even number of carbon atoms.
- B** They all contain the same functional group.
- C** They are all hydrocarbons.
- D** They are all saturated.

40 The table shows some suggested reactions involving ethanol.

Which suggestions about the reactants and products are correct?

reaction	reactants	products
<b>A</b>	ethanol and oxygen	carbon dioxide and water
<b>B</b>	ethene and steam	ethanol and hydrogen
<b>C</b>	glucose and oxygen	ethanol and carbon dioxide
<b>D</b>	glucose and water	ethanol and oxygen

**DATA SHEET**  
**The Periodic Table of the Elements**

		Group																																																																																																												
I	II	III	IV	V	VI	VII	0																																																																																																							
7 <b>Li</b> Lithium 3	9 <b>Be</b> Beryllium 4	1 <b>H</b> Hydrogen 1	11 <b>B</b> Boron 5	12 <b>C</b> Carbon 6	13 <b>Al</b> Aluminium 13	14 <b>N</b> Nitrogen 7	15 <b>O</b> Oxygen 8	16 <b>F</b> Fluorine 9	17 <b>Ne</b> Neon 10	18 <b>Ar</b> Argon 18	19 <b>K</b> Potassium 19	20 <b>Ca</b> Calcium 20	21 <b>Sc</b> Scandium 21	22 <b>Ti</b> Titanium 22	23 <b>V</b> Vanadium 23	24 <b>Cr</b> Chromium 24	25 <b>Mn</b> Manganese 25	26 <b>Fe</b> Iron 26	27 <b>Co</b> Cobalt 27	28 <b>Ni</b> Nickel 28	29 <b>Cu</b> Copper 29	30 <b>Zn</b> Zinc 30	31 <b>Ga</b> Gallium 31	32 <b>Ge</b> Germanium 32	33 <b>As</b> Arsenic 33	34 <b>Se</b> Selenium 34	35 <b>Br</b> Bromine 35	36 <b>Kr</b> Krypton 36	37 <b>Rb</b> Rubidium 37	38 <b>Sr</b> Strontium 38	39 <b>Y</b> Yttrium 39	40 <b>Zr</b> Zirconium 40	41 <b>Nb</b> Niobium 41	42 <b>Mo</b> Molybdenum 42	43 <b>Tc</b> Technetium 43	44 <b>Ru</b> Ruthenium 44	45 <b>Rh</b> Rhodium 45	46 <b>Pd</b> Palladium 46	47 <b>Ag</b> Silver 47	48 <b>Cd</b> Cadmium 48	49 <b>In</b> Indium 49	50 <b>Sn</b> Tin 50	51 <b>Sb</b> Antimony 51	52 <b>Te</b> Tellurium 52	53 <b>I</b> Iodine 53	54 <b>Xe</b> Xenon 54	55 <b>Cs</b> Caesium 55	56 <b>Ba</b> Barium 56	57 <b>La</b> Lanthanum 57	58 <b>Ce</b> Cerium 58	59 <b>Pr</b> Praseodymium 59	60 <b>Nd</b> Neodymium 60	61 <b>Pm</b> Promethium 61	62 <b>Sm</b> Samarium 62	63 <b>Eu</b> Europium 63	64 <b>Gd</b> Gadolinium 64	65 <b>Tb</b> Terbium 65	66 <b>Dy</b> Dysprosium 66	67 <b>Ho</b> Holmium 67	68 <b>Er</b> Erbium 68	69 <b>Tm</b> Thulium 69	70 <b>Yb</b> Ytterbium 70	71 <b>Lu</b> Lutetium 71	72 <b>Hf</b> Hafnium 72	73 <b>Ta</b> Tantalum 73	74 <b>W</b> Tungsten 74	75 <b>Re</b> Rhenium 75	76 <b>Os</b> Osmium 76	77 <b>Ir</b> Iridium 77	78 <b>Pt</b> Platinum 78	79 <b>Au</b> Gold 79	80 <b>Hg</b> Mercury 80	81 <b>Tl</b> Thallium 81	82 <b>Pb</b> Lead 82	83 <b>Bi</b> Bismuth 83	84 <b>Po</b> Polonium 84	85 <b>At</b> Astatine 85	86 <b>Rn</b> Radon 86	87 <b>Fr</b> Francium 87	88 <b>Ra</b> Radium 88	89 <b>Ac</b> Actinium 89	90 <b>Th</b> Thorium 90	91 <b>Pa</b> Protactinium 91	92 <b>U</b> Uranium 92	93 <b>Np</b> Neptunium 93	94 <b>Pu</b> Plutonium 94	95 <b>Am</b> Americium 95	96 <b>Cm</b> Curium 96	97 <b>Bk</b> Berkelium 97	98 <b>Cf</b> Californium 98	99 <b>Es</b> Einsteinium 99	100 <b>Fm</b> Fermium 100	101 <b>Md</b> Mendelevium 101	102 <b>No</b> Nobelium 102	103 <b>Lr</b> Lawrencium 103	104 <b>Rf</b> Rutherfordium 104	105 <b>Db</b> Dubnium 105	106 <b>Sg</b> Seaborgium 106	107 <b>Bh</b> Bohrium 107	108 <b>Hs</b> Hassium 108	109 <b>Mt</b> Meitnerium 109	110 <b>Ds</b> Darmstadtium 110	111 <b>Rg</b> Roentgenium 111	112 <b>Cn</b> Copernicium 112	113 <b>Nh</b> Nihonium 113	114 <b>Fl</b> Flerovium 114	115 <b>Mc</b> Moscovium 115	116 <b>Lv</b> Livermorium 116	117 <b>Ts</b> Tennessine 117	118 <b>Og</b> Oganesson 118

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

$a$     **X**     $b$   
 a = relative atomic mass  
 X = atomic symbol  
 b = proton (atomic) number

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.).