

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.



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

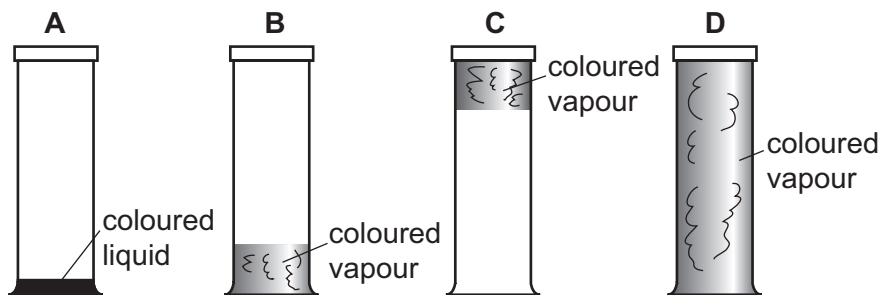
Three of their suggestions are:

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

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

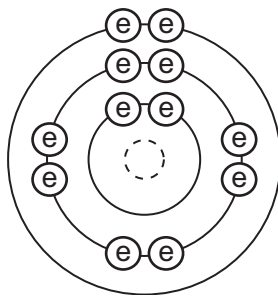
<ul style="list-style-type: none"> <li>● yellow</li> <li>● red</li> </ul>	<ul style="list-style-type: none"> <li>● red</li> <li>● yellow</li> </ul>	<ul style="list-style-type: none"> <li>● red</li> <li>● yellow</li> <li>● red</li> </ul>
sweet X	sweet Y	sweet Z

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.



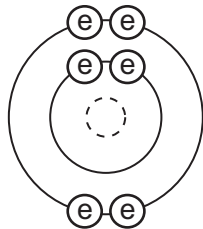
key

⊙ electron

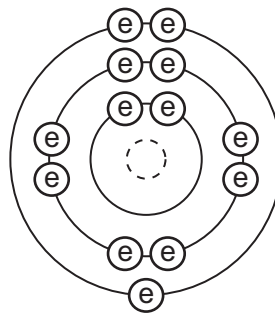
⊖ nucleus

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

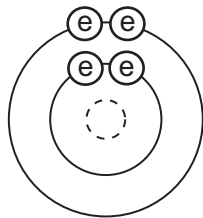
**A**



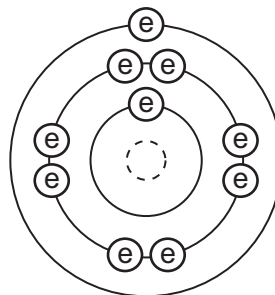
**B**



**C**



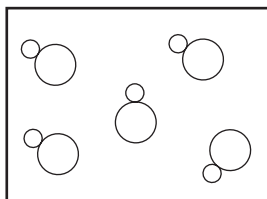
**D**



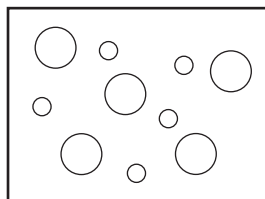
7 In the diagrams, circles of different sizes represent atoms of different elements.

Which diagram can represent hydrogen chloride gas?

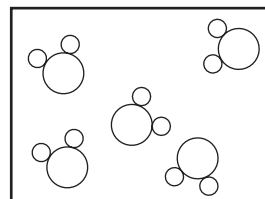
**A**



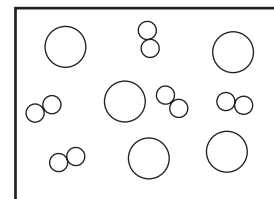
**B**



**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?

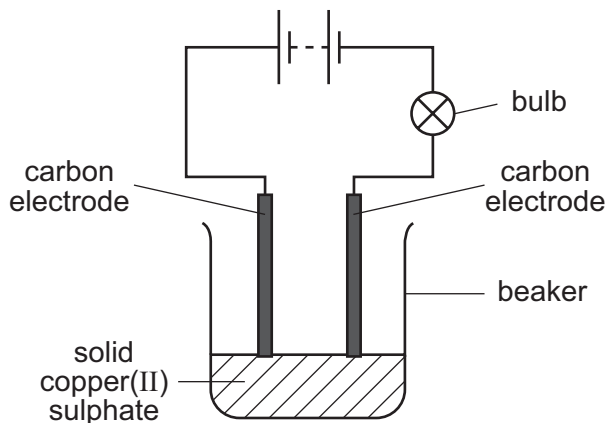
- A** 34                      **B** 50                      **C** 61                      **D** 62

- 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.

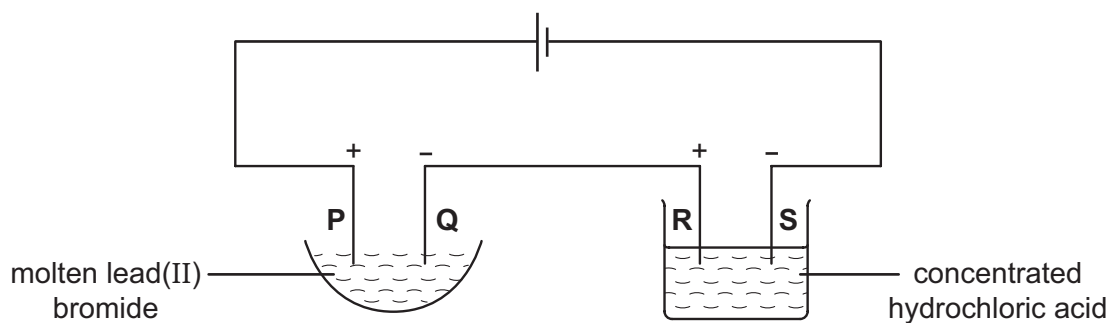
12 In the circuit shown the bulb does not light.



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?

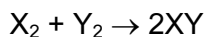
- A P only
- B P and R
- C Q only
- D Q and S

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**.

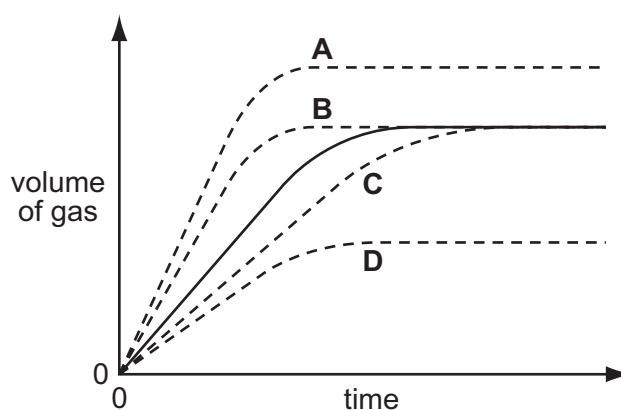
What happens to the copper(II) oxide and what is **X**?

	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**  


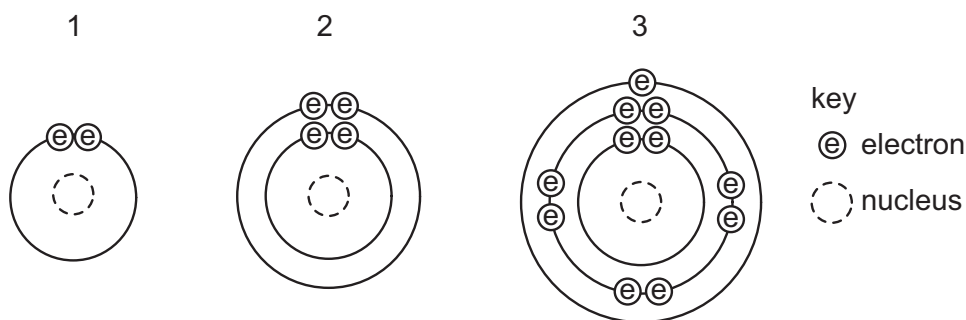
**Y**  

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.



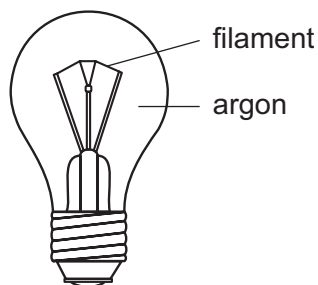
Which atoms are metals?

- 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

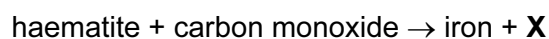
26 Three metals are extracted as shown in the table.

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.



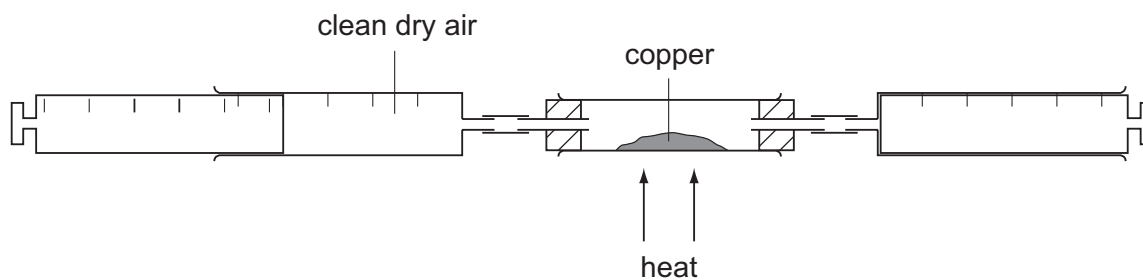
What is **X**?

- 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

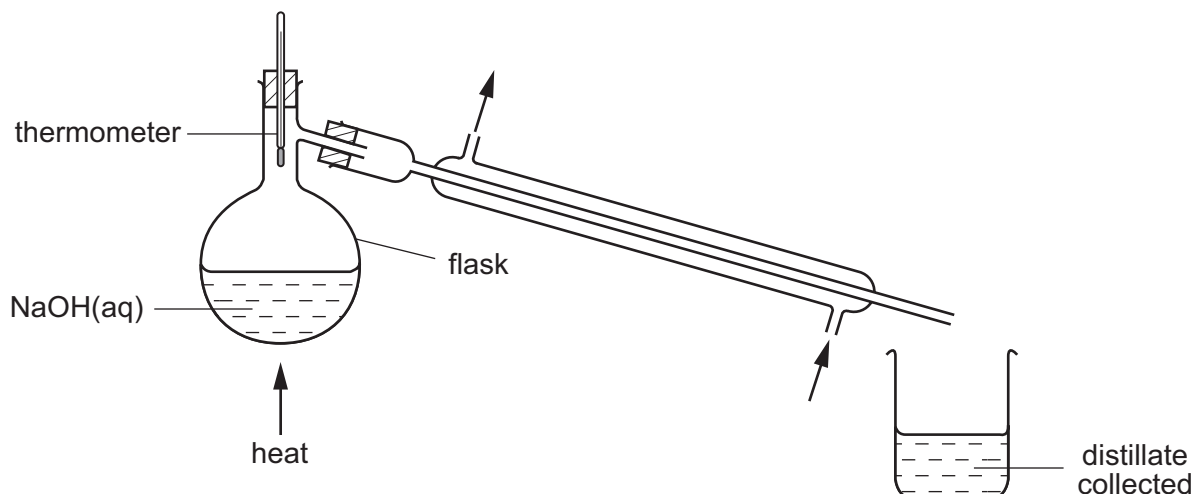
- 29 A sample of clean, dry air is passed over hot copper until **all** the oxygen in the air reacts with the copper.



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

What was the starting volume of the sample of air?

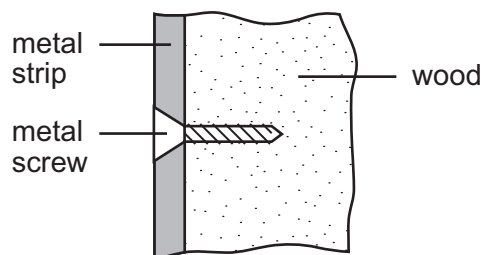
- A  $60 \text{ cm}^3$       B  $100 \text{ cm}^3$       C  $150 \text{ cm}^3$       D  $300 \text{ cm}^3$
- 30 The pH of some aqueous sodium hydroxide is measured. The solution is then distilled as shown.



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.

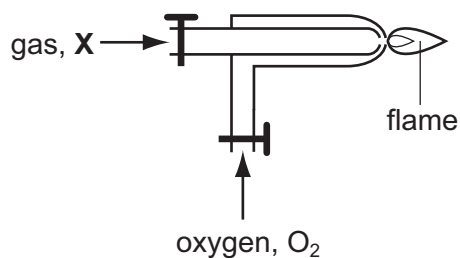


Aluminium is more reactive than both steel and copper.

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.



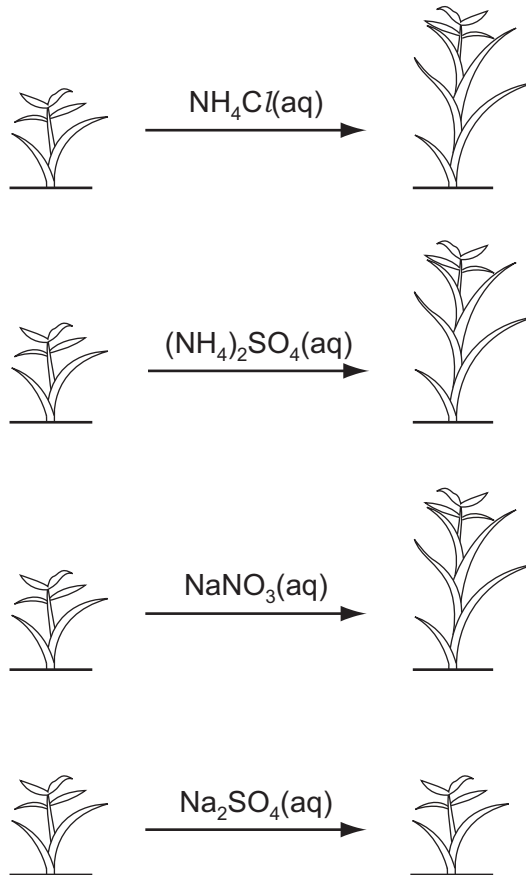
What is gas **X**?

- 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.



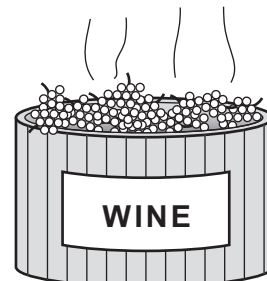
acid rain on a limestone statue



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?

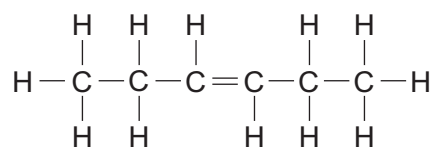
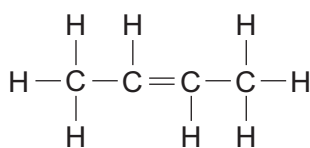
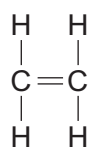
- A ethanol
- B ethene
- C methane
- D poly(ethene)

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	3	<b>Li</b> Lithium 4	<b>Be</b> Beryllium 4	<b>H</b> Hydrogen 1	<b>B</b> Boron 5	<b>C</b> Carbon 6	<b>N</b> Nitrogen 7	<b>O</b> Oxygen 8	<b>F</b> Fluorine 9	<b>Ne</b> Neon 10	
23	11	<b>Na</b> Sodium 11	<b>Mg</b> Magnesium 12	<b>Al</b> Aluminium 13	<b>Si</b> Silicon 14	<b>P</b> Phosphorus 15	<b>S</b> Sulphur 16	<b>Cl</b> Chlorine 17	<b>Ar</b> Argon 18		
39	19	<b>K</b> Potassium 19	<b>Ca</b> Calcium 20	<b>Sc</b> Scandium 21	<b>Ti</b> Titanium 22	<b>V</b> Vanadium 23	<b>Cr</b> Chromium 24	<b>Mn</b> Manganese 25	<b>Fe</b> Iron 26	<b>Zn</b> Zinc 30	
85	37	<b>Rb</b> Rubidium 37	<b>Sr</b> Strontium 38	<b>Y</b> Yttrium 39	<b>Zr</b> Zirconium 40	<b>Nb</b> Niobium 41	<b>Mo</b> Molybdenum 42	<b>Tc</b> Technetium 43	<b>Ru</b> Ruthenium 44	<b>Cd</b> Cadmium 48	
133	55	<b>Cs</b> Caesium 55	<b>Ba</b> Barium 56	<b>La</b> Lanthanum 57	<b>Hf</b> Hafnium 72	<b>Ta</b> Tantalum 73	<b>W</b> Tungsten 74	<b>Re</b> Rhenium 75	<b>Os</b> Osmium 76	<b>Hg</b> Mercury 80	
227	87	<b>Fr</b> Francium 87	<b>Ra</b> Radium 88	<b>Ac</b> Actinium 89	<b>Pt</b> Platinum 78	<b>Ir</b> Iridium 77	<b>Pd</b> Palladium 46	<b>Ni</b> Nickel 28	<b>Cu</b> Copper 29	<b>Ag</b> Silver 47	
115	51	<b>In</b> Indium 49	<b>Sn</b> Tin 50	<b>Pb</b> Lead 82	<b>Tl</b> Thallium 81	<b>Po</b> Polonium 84	<b>Bi</b> Bismuth 83	<b>At</b> Astatine 85	<b>Rn</b> Radon 86		
119	53	<b>Tl</b> Thallium 81	<b>Pb</b> Lead 82	<b>Bi</b> Bismuth 83	<b>Po</b> Polonium 84	<b>At</b> Astatine 85	<b>Rn</b> Radon 86	<b>Fr</b> Francium 87	<b>Ra</b> Radium 88	<b>Ac</b> Actinium 89	
127	54	<b>I</b> Iodine 53	<b>Xe</b> Xenon 54	<b>Te</b> Tellurium 52	<b>Sb</b> Antimony 51	<b>Sn</b> Tin 50	<b>Pb</b> Lead 82	<b>Bi</b> Bismuth 83	<b>Po</b> Polonium 84	<b>At</b> Astatine 85	
128	52	<b>Te</b> Tellurium 52	<b>Sb</b> Antimony 51	<b>Pb</b> Lead 82	<b>Bi</b> Bismuth 83	<b>Po</b> Polonium 84	<b>At</b> Astatine 85	<b>Rn</b> Radon 86	<b>Fr</b> Francium 87	<b>Ra</b> Radium 88	
131	54	<b>Xe</b> Xenon 54	<b>Te</b> Tellurium 52	<b>Sb</b> Antimony 51	<b>Pb</b> Lead 82	<b>Bi</b> Bismuth 83	<b>Po</b> Polonium 84	<b>At</b> Astatine 85	<b>Rn</b> Radon 86	<b>Fr</b> Francium 87	
135	55	<b>At</b> Astatine 85	<b>Rn</b> Radon 86	<b>Fr</b> Francium 87	<b>Ra</b> Radium 88	<b>Ac</b> Actinium 89	<b>Th</b> Thorium 90	<b>Pa</b> Protactinium 91	<b>U</b> Uranium 92	<b>Np</b> Neptunium 93	
173	71	<b>Lu</b> Lutetium 71	<b>Lr</b> Lawrencium 103	<b>Yb</b> Ytterbium 70	<b>No</b> Nobelium 102	<b>Md</b> Mendelevium 101	<b>Fm</b> Fermium 100	<b>Es</b> Einsteinium 99	<b>Cf</b> Californium 98	<b>Bk</b> Berkelium 97	
169	69	<b>Tm</b> Thulium 69	<b>Md</b> Mendelevium 101	<b>Er</b> Erbium 68	<b>Fm</b> Fermium 100	<b>Es</b> Einsteinium 99	<b>Cf</b> Californium 98	<b>Bk</b> Berkelium 97	<b>Am</b> Americium 95	<b>Pu</b> Plutonium 94	
167	68	<b>Er</b> Erbium 68	<b>Fm</b> Fermium 100	<b>Dy</b> Dysprosium 66	<b>Ho</b> Holmium 67	<b>Er</b> Erbium 68	<b>Fm</b> Fermium 100	<b>Es</b> Einsteinium 99	<b>Cf</b> Californium 98	<b>Bk</b> Berkelium 97	
165	67	<b>Ho</b> Holmium 67	<b>Es</b> Einsteinium 99	<b>Tb</b> Terbium 65	<b>Gd</b> Gadolinium 64	<b>Tb</b> Terbium 65	<b>Bk</b> Berkelium 97	<b>Am</b> Americium 95	<b>Pu</b> Plutonium 94	<b>U</b> Uranium 92	
162	66	<b>Dy</b> Dysprosium 66	<b>Cf</b> Californium 98	<b>Gd</b> Gadolinium 64	<b>Eu</b> Europium 63	<b>Gd</b> Gadolinium 64	<b>Am</b> Americium 95	<b>Pu</b> Plutonium 94	<b>U</b> Uranium 92	<b>Np</b> Neptunium 93	
159	65	<b>Tb</b> Terbium 65	<b>Bk</b> Berkelium 97	<b>Eu</b> Europium 63	<b>Am</b> Americium 95	<b>Pu</b> Plutonium 94	<b>U</b> Uranium 92	<b>Np</b> Neptunium 93	<b>Np</b> Neptunium 93	<b>Np</b> Neptunium 93	
157	64	<b>Gd</b> Gadolinium 64	<b>Cm</b> Curium 96	<b>Sm</b> Samarium 62	<b>Pu</b> Plutonium 94	<b>U</b> Uranium 92	<b>Np</b> Neptunium 93	<b>Np</b> Neptunium 93	<b>Np</b> Neptunium 93	<b>Np</b> Neptunium 93	
152	63	<b>Eu</b> Europium 63	<b>Am</b> Americium 95	<b>Pm</b> Promethium 61	<b>Nd</b> Neodymium 60	<b>Pm</b> Promethium 61	<b>Nd</b> Neodymium 60	<b>Nd</b> Neodymium 60	<b>Nd</b> Neodymium 60	<b>Nd</b> Neodymium 60	
144	60	<b>Pm</b> Promethium 61	<b>Am</b> Americium 95	<b>Sm</b> Samarium 62	<b>Pu</b> Plutonium 94	<b>U</b> Uranium 92	<b>Np</b> Neptunium 93	<b>Np</b> Neptunium 93	<b>Np</b> Neptunium 93	<b>Np</b> Neptunium 93	
141	59	<b>Pr</b> Praseodymium 59	<b>Pa</b> Protactinium 91	<b>Pd</b> Palladium 46	<b>Ni</b> Nickel 28	<b>Cu</b> Copper 29	<b>Ag</b> Silver 47	<b>Zn</b> Zinc 30	<b>Ga</b> Gallium 31	<b>Ge</b> Germanium 32	
140	58	<b>Ce</b> Cerium 58	<b>Th</b> Thorium 90	<b>Pr</b> Praseodymium 59	<b>Nd</b> Neodymium 60	<b>Pm</b> Promethium 61	<b>Nd</b> Neodymium 60	<b>Nd</b> Neodymium 60	<b>Nd</b> Neodymium 60	<b>Nd</b> Neodymium 60	

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

**Key**

$a$	<b>X</b>	$b$
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$a$  = relative atomic mass  
 $X$  = atomic symbol  
 $b$  = proton (atomic) number

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