



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

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**CHEMISTRY**

**5070/11**

Paper 1 Multiple Choice

**May/June 2010**

**1 hour**

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

\* 9 8 7 2 0 1 9 8 4 7 \*

**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.

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



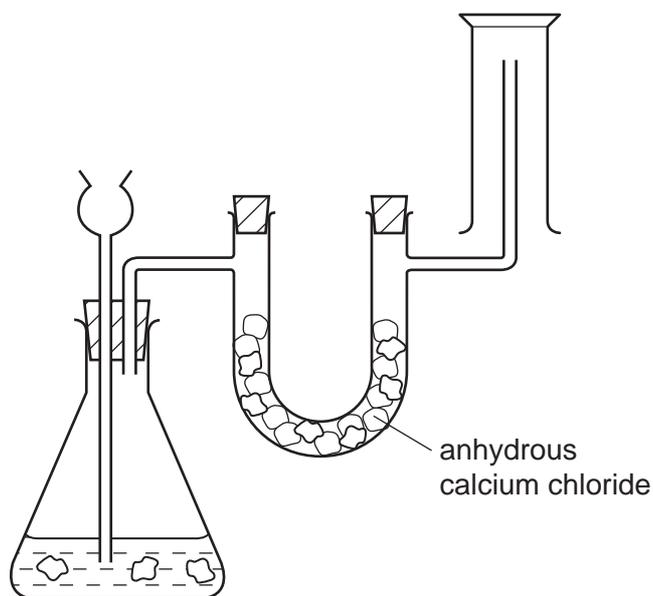
1 Which is an anion that is present in the solution formed when an excess of dilute acid is added to calcium carbonate?

- A  $\text{Ca}^{2+}$       B  $\text{Cl}^-$       C  $\text{CO}_3^{2-}$       D  $\text{H}^+$

2 What correctly describes the molecules in **very dilute** sugar solution at room temperature?

	sugar molecules	water molecules
<b>A</b>	close together, moving at random	close together, moving at random
<b>B</b>	widely separated, moving at random	close together, moving at random
<b>C</b>	widely separated, moving at random	close together, not moving
<b>D</b>	widely separated, not moving	widely separated, moving at random

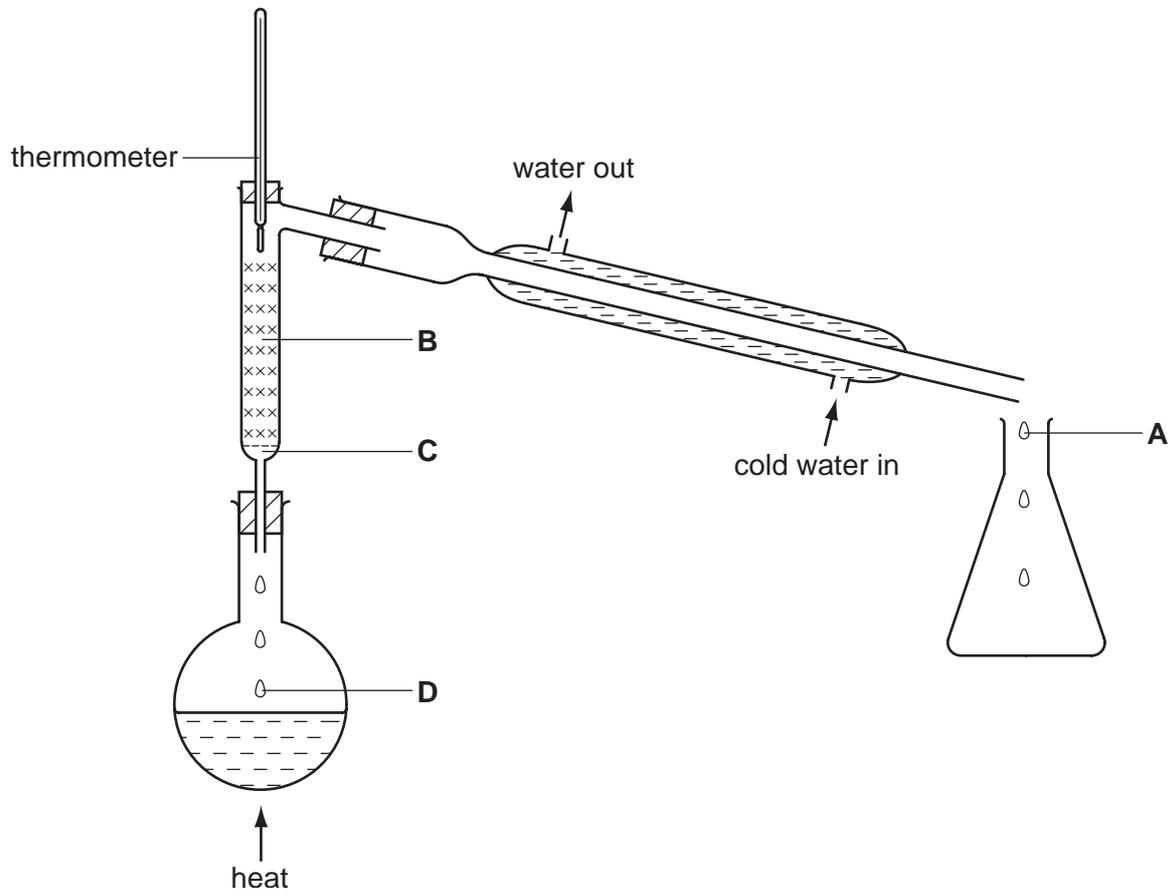
3 The diagram shows a simple laboratory apparatus for the preparation and collection of a dry gas.



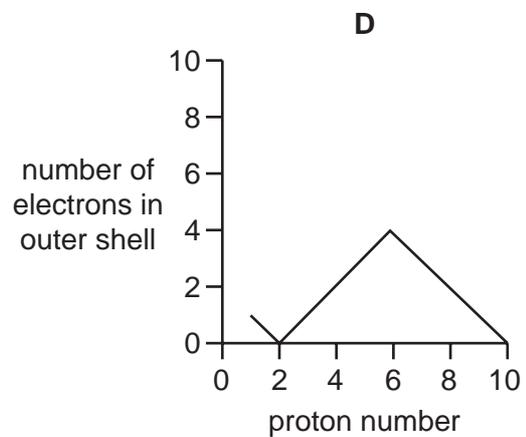
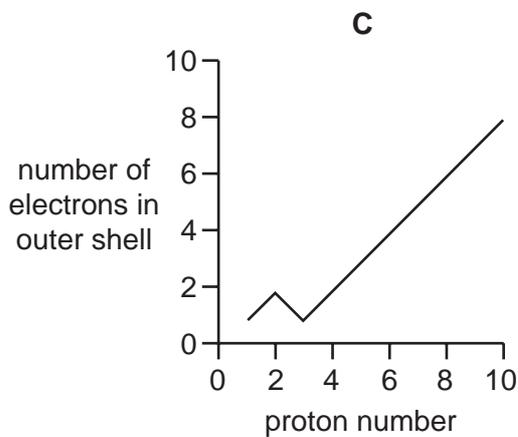
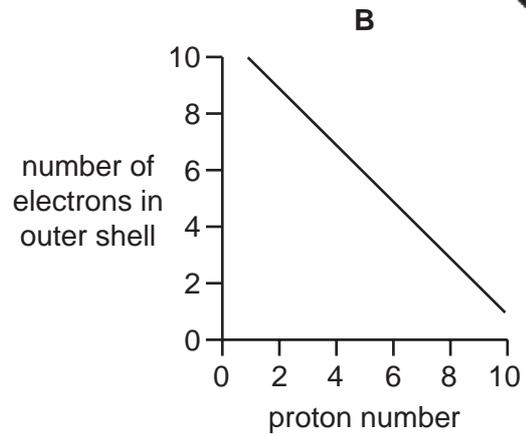
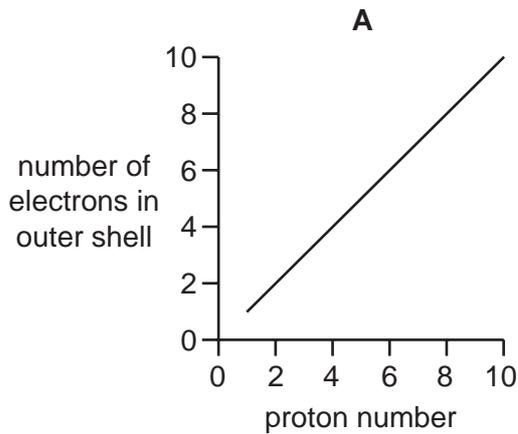
What is the gas?

- A carbon dioxide  
 B chlorine  
 C hydrogen  
 D hydrogen chloride

- 4 A mixture containing equal volumes of two liquids that mix completely but do not react is placed in the apparatus shown and heated until the thermometer first shows a steady reading. At which position will there be the highest proportion of the liquid with the higher boiling point?



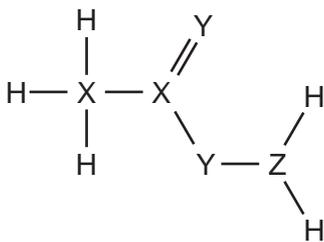
- 5 Which graph shows the number of electrons in the outer shell of an atom, plotted against proton (atomic) number for the first ten elements in the Periodic Table?



- 6 Which pair of elements, when combined together, do **not** form a covalent compound?

- A caesium and fluorine
- B nitrogen and chlorine
- C phosphorus and fluorine
- D sulfur and chlorine

- 7 The diagram shows the structure of a covalent compound containing the element X and the unknown elements Y and Z.



To which groups of the Periodic Table do these three elements, X, Y and Z, belong?

	X	Y	Z
<b>A</b>	1	5	6
<b>B</b>	4	5	1
<b>C</b>	4	6	5
<b>D</b>	5	1	4

- 8 A metal consists of a lattice of positive ions in a 'sea of electrons'.

What changes, if any, take place to the electrons and positive ions in a metal wire when an electric current is passed through it?

	electrons	positive ions
<b>A</b>	replaced by new electrons	replaced by new ions
<b>B</b>	replaced by new electrons	unchanged
<b>C</b>	unchanged	replaced by new ions
<b>D</b>	unchanged	unchanged

- 9 What is the mass of one mole of carbon-12?

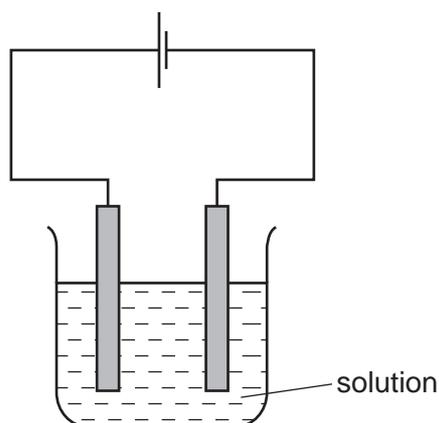
**A** 0.012g      **B** 0.024g      **C** 1g      **D** 12g

- 10 Two different hydrocarbons each contain the same percentage by mass of hydrogen.

It follows that they have the same

- A** empirical formula.  
**B** number of isomers.  
**C** relative molecular mass.  
**D** structural formula.

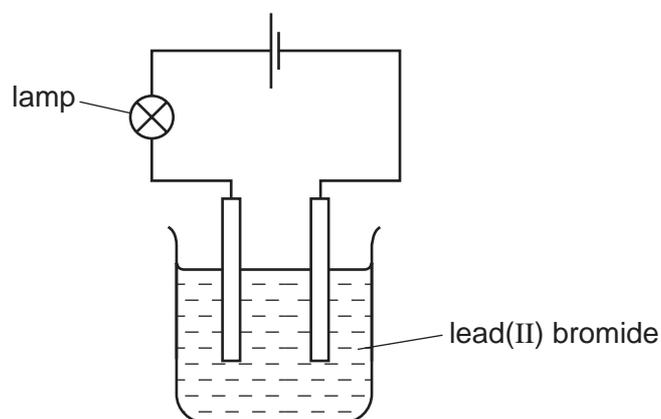
- 11 The diagram shows the electrolysis of a concentrated aqueous solution containing copper(II) ions and sodium ions.



Which metal is deposited at the negative electrode and why?

	metal deposited	reason
<b>A</b>	copper	copper is less reactive than sodium
<b>B</b>	copper	copper is more reactive than hydrogen
<b>C</b>	sodium	copper is less reactive than hydrogen
<b>D</b>	sodium	copper is more reactive than sodium

- 12 The diagram shows the apparatus used to electrolyse lead(II) bromide using inert electrodes.



Why does the lamp light up only when the lead(II) bromide is melted?

- A** Bromine atoms in the lead(II) bromide are converted to ions when it is melted.  
**B** Electrons flow through the lead(II) bromide when it is melted.  
**C** The ions in lead(II) bromide are free to move only when the solid is melted.  
**D** There are no ions in solid lead(II) bromide.

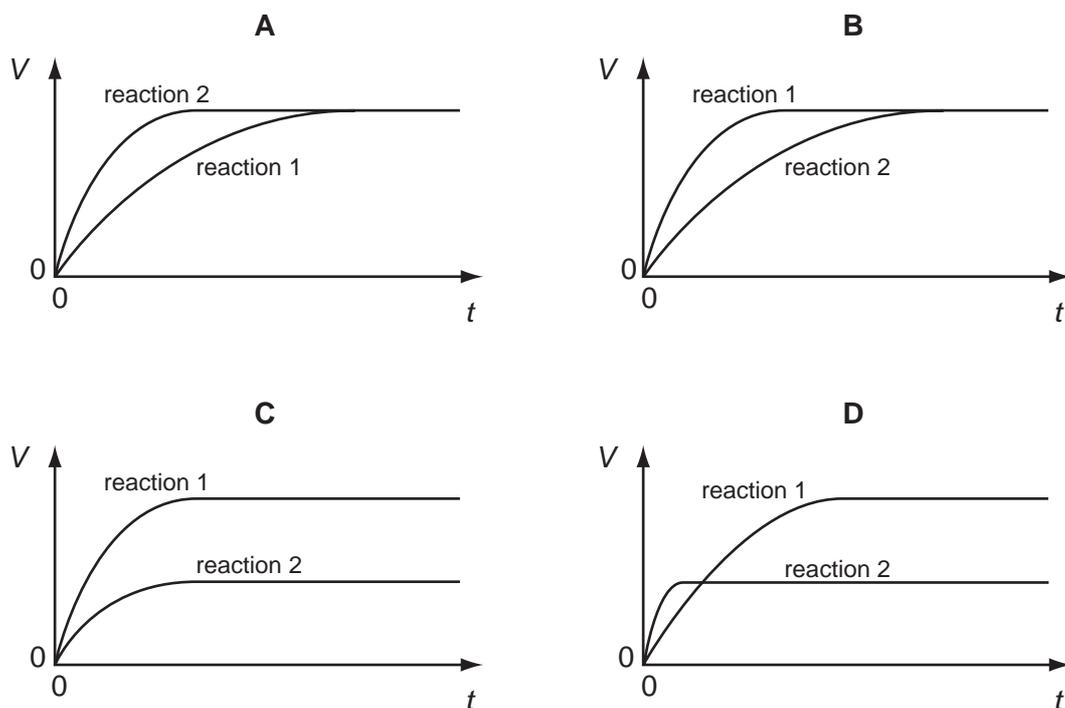
13 A student performs two reactions.

reaction 1 10 g of magnesium ribbon with excess  $2.0 \text{ mol/dm}^3$  dilute hydrochloric acid

reaction 2 5 g of magnesium powder with excess  $2.0 \text{ mol/dm}^3$  dilute hydrochloric acid

In both experiments, the volume of hydrogen produced,  $V$ , is measured against time,  $t$ , and the results plotted graphically.

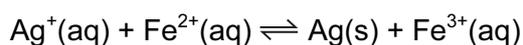
Which set of graphs is correct?



14 Which statement about catalysts is correct for a typical equilibrium reaction?

- A A catalyst can be either an inorganic or an organic species.
- B A catalyst does not take part in the reaction.
- C A catalyst only speeds up the forward reaction.
- D A catalyst provides the energy required to start a reaction.

15 When a solution containing silver ions is added to a solution containing iron(II) ions, an equilibrium is set up.



The addition of which substance would **not** affect the amount of silver precipitated?

- A  $\text{Ag}^+(\text{aq})$
- B  $\text{Fe}^{2+}(\text{aq})$
- C  $\text{Fe}^{3+}(\text{aq})$
- D  $\text{H}_2\text{O}(\text{l})$

16 Which reaction does **not** involve either oxidation or reduction?

- A  $\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{g})$
- B  $\text{Cu}^{2+}(\text{aq}) + \text{Zn}(\text{s}) \rightarrow \text{Cu}(\text{s}) + \text{Zn}^{2+}(\text{aq})$
- C  $\text{CuO}(\text{s}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{CuSO}_4(\text{aq}) + \text{H}_2\text{O}(\text{l})$
- D  $\text{Zn}(\text{s}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{ZnSO}_4(\text{aq}) + \text{H}_2(\text{g})$

17 Which pair of compounds could be used in the preparation of calcium sulfate?

- A calcium carbonate and sodium sulfate
- B calcium chloride and ammonium sulfate
- C calcium hydroxide and barium sulfate
- D calcium nitrate and lead(II) sulfate

18 A metal reacts with dilute hydrochloric acid to produce a gas.

What is used to identify this gas?

- A a glowing splint
- B a lighted splint
- C damp blue litmus paper
- D limewater

19 Titration of an acid against a base is a method often used in the preparation of salts.

Which properties of the acid, the base and the salt are required if this method is to be used?

	acid	base	salt
<b>A</b>	insoluble	insoluble	insoluble
<b>B</b>	soluble	insoluble	insoluble
<b>C</b>	soluble	soluble	insoluble
<b>D</b>	soluble	soluble	soluble



23 Which element is sodium?

	melting point in °C	electrical conduction	density in g/cm <sup>3</sup>
<b>A</b>	1535	good	7.86
<b>B</b>	1083	good	8.92
<b>C</b>	113	poor	2.07
<b>D</b>	98	good	0.97

24 Which substances react together to give hydrogen?

- A** calcium oxide and water
- B** copper and dilute sulfuric acid
- C** copper and steam
- D** magnesium and steam

25 In the extraction of iron, carbon monoxide acts as

- A** a catalyst.
- B** an inert gas.
- C** an oxidising agent.
- D** a reducing agent.

26 An alloy of copper and zinc is added to an excess of dilute hydrochloric acid.

Which observations are correct?

	residue	filtrate
<b>A</b>	grey	blue solution
<b>B</b>	none	blue solution
<b>C</b>	none	colourless solution
<b>D</b>	red-brown	colourless solution

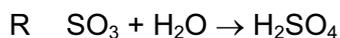
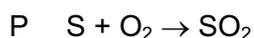
- 27 From your knowledge of the manufacture of both aluminium and iron, what is the chemical reactivity of aluminium, carbon and iron towards oxygen?

	most reactive	—————▶	least reactive
<b>A</b>	aluminium	carbon	iron
<b>B</b>	aluminium	iron	carbon
<b>C</b>	carbon	aluminium	iron
<b>D</b>	carbon	iron	aluminium

- 28 Which compound will **not** produce ammonia when heated with ammonium sulfate?

- A** calcium oxide  
**B** magnesium oxide  
**C** sodium hydroxide  
**D** sulfuric acid

- 29 These reactions are used in the manufacture of sulfuric acid.



Which reactions are speeded up by using a catalyst?

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

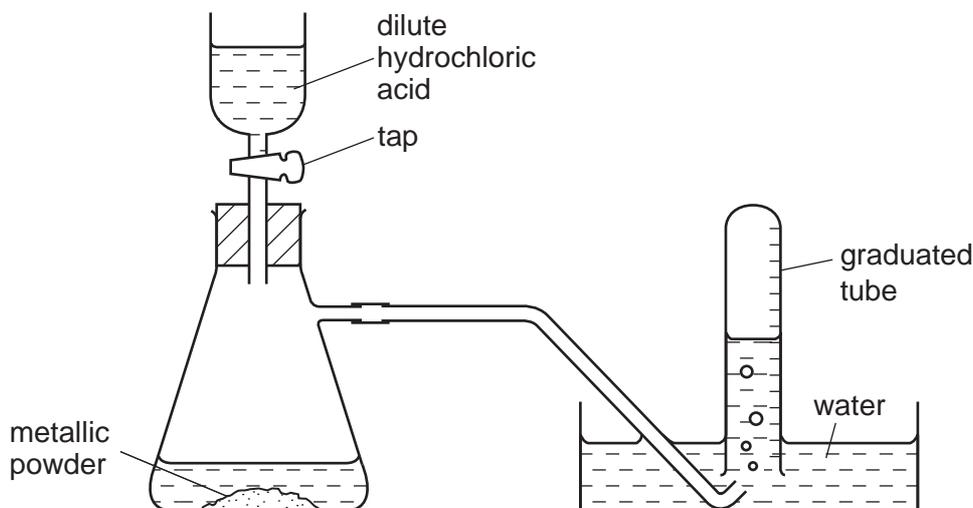
- 30 Why is carbon used in the purification of drinking water?

- A** It desalinates the water.  
**B** It disinfects the water.  
**C** It filters out solids.  
**D** It removes tastes and odours from the water.

- 31 Which gas burns in air to form only one product?

- A** ammonia  
**B** carbon monoxide  
**C** hydrogen chloride  
**D** methane

- 32 The diagram shows apparatus for measuring the volume of hydrogen given off when dilute hydrochloric acid is added to powdered metal. The volume of gas is measured at room temperature and pressure.



The experiment is carried out three times, using the same mass of powder each time but with different powders:

- pure magnesium
- pure zinc
- a mixture of magnesium and zinc

Which powder gives the greatest volume of hydrogen and which the least volume?

	greatest volume of H <sub>2</sub>	least volume of H <sub>2</sub>
<b>A</b>	magnesium	zinc
<b>B</b>	magnesium	the mixture
<b>C</b>	zinc	magnesium
<b>D</b>	zinc	the mixture

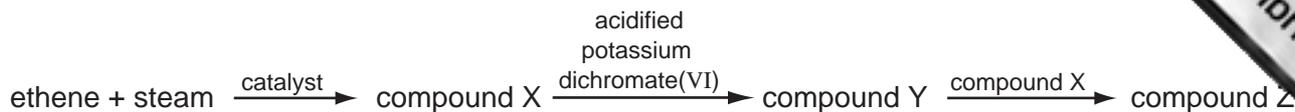
- 33 The list shows three chemical reactions.

- 1 combustion of ethanol
- 2 fermentation of glucose
- 3 reaction of ethanol with ethanoic acid to give an ester

In which reactions is water a product?

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

34 The diagram shows a reaction scheme.



What is the final compound, Z?

- A** a carboxylic acid  
**B** an alcohol  
**C** an alkene  
**D** an ester
- 35 How does the number of carbon, hydrogen and oxygen atoms in an ester differ from the total number of carbon, hydrogen and oxygen atoms in the alcohol and carboxylic acid from which the compound was derived?

	carbon atoms	hydrogen atoms	oxygen atoms
<b>A</b>	less	less	less
<b>B</b>	less	same	less
<b>C</b>	same	less	less
<b>D</b>	same	same	same

36 The two statements are about the fractional distillation of crude oil. The statements may or may not be correct. They may or may not be linked.

statement 1 Fractional distillation is used to separate crude oil into useful fractions.

statement 2 The fractions with lower boiling points are found at the top of the fractionating column.

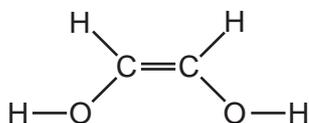
What is correct about these two statements?

- A** Both statements are correct and statement 2 explains statement 1.  
**B** Both statements are correct but statement 2 does not explain statement 1.  
**C** Statement 1 is correct but statement 2 is incorrect.  
**D** Statement 1 is incorrect but statement 2 is correct.

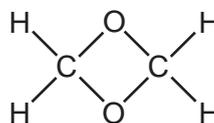
- 37 An aqueous solution of a compound of formula  $C_2H_4O_2$  reacts with sodium carbonate to form sodium acetate and carbon dioxide.

What is the structural formula of the compound?

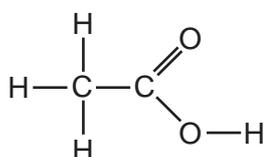
A



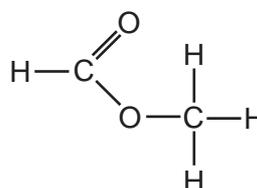
B



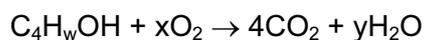
C



D



- 38 When butanol, represented by  $C_4H_wOH$ , burns in air, carbon dioxide and water are formed.



Which values of  $w$ ,  $x$  and  $y$  balance the equation?

	w	x	y
<b>A</b>	8	6	4
<b>B</b>	9	6	4
<b>C</b>	9	6	5
<b>D</b>	10	7	5

- 39 Which substances will burn in air and give carbon dioxide amongst the combustion products?

- 1 calcium carbonate
- 2 ethane
- 3 ethanol
- 4 methanol

- A** 1 and 2 only    **B** 2 and 3 only    **C** 1, 2 and 3 only    **D** 2, 3 and 4 only

- 40 The macromolecules of proteins, fats and carbohydrates can all be broken down into units by a similar process.

What is the process called?

- A esterification
- B hydrolysis
- C oxidation
- D reduction

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

		Group														
I	II	III	IV	V	VI	VII	0									
		1 <b>H</b> Hydrogen 1										4 <b>He</b> Helium 2				
7 <b>Li</b> Lithium 3	9 <b>Be</b> Beryllium 4											20 <b>Ne</b> Neon 10				
23 <b>Na</b> Sodium 11	24 <b>Mg</b> Magnesium 12	11 <b>B</b> Boron 5	12 <b>C</b> Carbon 6	14 <b>N</b> Nitrogen 7	16 <b>O</b> Oxygen 8	19 <b>F</b> Fluorine 9		31 <b>P</b> Phosphorus 15	32 <b>S</b> Sulfur 16	35.5 <b>Cl</b> Chlorine 17		40 <b>Ar</b> Argon 18				
39 <b>K</b> Potassium 19	40 <b>Ca</b> Calcium 20	27 <b>Al</b> Aluminium 13	28 <b>Si</b> Silicon 14	73 <b>Ge</b> Germanium 32	75 <b>As</b> Arsenic 33	79 <b>Se</b> Selenium 34		70 <b>Ga</b> Gallium 31	73 <b>Ge</b> Germanium 32	75 <b>As</b> Arsenic 33	79 <b>Se</b> Selenium 34	84 <b>Kr</b> Krypton 36				
85 <b>Rb</b> Rubidium 37	88 <b>Sr</b> Strontium 38	56 <b>Fe</b> Iron 26	59 <b>Co</b> Cobalt 27	64 <b>Cu</b> Copper 29	65 <b>Zn</b> Zinc 30	106 <b>Pd</b> Palladium 46		101 <b>Ru</b> Ruthenium 44	103 <b>Rh</b> Rhodium 45	108 <b>Ag</b> Silver 47	112 <b>Cd</b> Cadmium 48	115 <b>In</b> Indium 49	122 <b>Sb</b> Antimony 51	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54	
133 <b>Cs</b> Caesium 55	137 <b>Ba</b> Barium 56	52 <b>Cr</b> Chromium 24	55 <b>Mn</b> Manganese 25	59 <b>Ni</b> Nickel 28	64 <b>Cu</b> Copper 29	96 <b>Mo</b> Molybdenum 42		93 <b>Nb</b> Niobium 41	96 <b>Mo</b> Molybdenum 42	101 <b>Ru</b> Ruthenium 44	103 <b>Rh</b> Rhodium 45	106 <b>Pd</b> Palladium 46	109 <b>Sn</b> Tin 50	128 <b>Te</b> Tellurium 52	131 <b>Xe</b> Xenon 54	
226 <b>Ra</b> Radium 88	227 <b>Ac</b> Actinium 89	140 <b>Ce</b> Cerium 58	141 <b>Pr</b> Praseodymium 59	144 <b>Nd</b> Neodymium 60	150 <b>Sm</b> Samarium 62	152 <b>Eu</b> Europium 63		148 <b>Os</b> Osmium 76	150 <b>Ir</b> Iridium 77	157 <b>Au</b> Gold 79	180 <b>Hg</b> Mercury 80	201 <b>Tl</b> Thallium 81	207 <b>Pb</b> Lead 82	209 <b>Bi</b> Bismuth 83	210 <b>Po</b> Polonium 84	210 <b>Rn</b> Radon 86
		140 <b>Ce</b> Cerium 58	141 <b>Pr</b> Praseodymium 59	144 <b>Nd</b> Neodymium 60	150 <b>Sm</b> Samarium 62	152 <b>Eu</b> Europium 63		157 <b>Gd</b> Gadolinium 64	159 <b>Tb</b> Terbium 65	162 <b>Dy</b> Dysprosium 66	165 <b>Ho</b> Holmium 67	167 <b>Er</b> Erbium 68	169 <b>Tm</b> Thulium 69	173 <b>Yb</b> Ytterbium 70	175 <b>Lu</b> Lutetium 71	175 <b>Lu</b> Lutetium 71
		232 <b>Th</b> Thorium 90	238 <b>U</b> Uranium 92	238 <b>U</b> Uranium 92	238 <b>U</b> Uranium 92	238 <b>U</b> Uranium 92		238 <b>U</b> Uranium 92	238 <b>U</b> Uranium 92	238 <b>U</b> Uranium 92	238 <b>U</b> Uranium 92	238 <b>U</b> Uranium 92	238 <b>U</b> Uranium 92	238 <b>U</b> Uranium 92	238 <b>U</b> Uranium 92	238 <b>U</b> Uranium 92

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

	a	X	a = relative atomic mass X = atomic symbol b = proton (atomic) number
Key	b	X	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.).