



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

**CHEMISTRY**

**5070/01**

Paper 1 Multiple Choice

**May/June 2009**

**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 16.

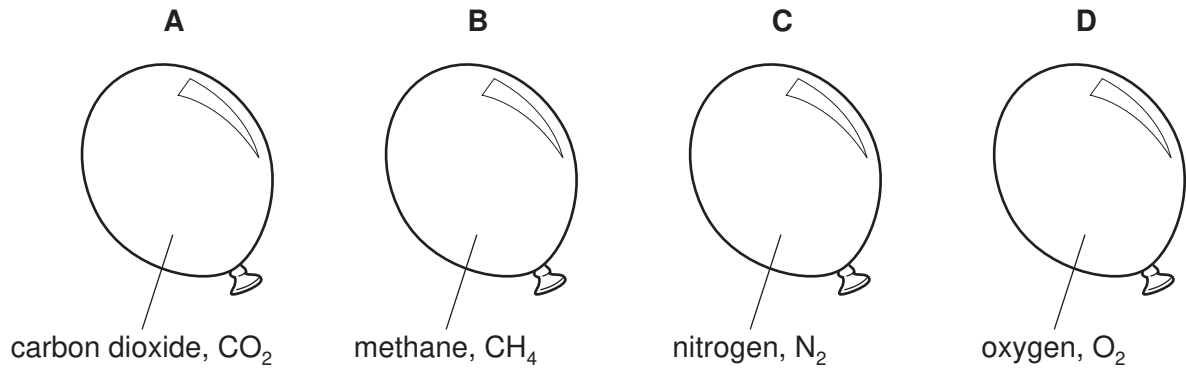
This document consists of **15** printed pages and **1** blank page.



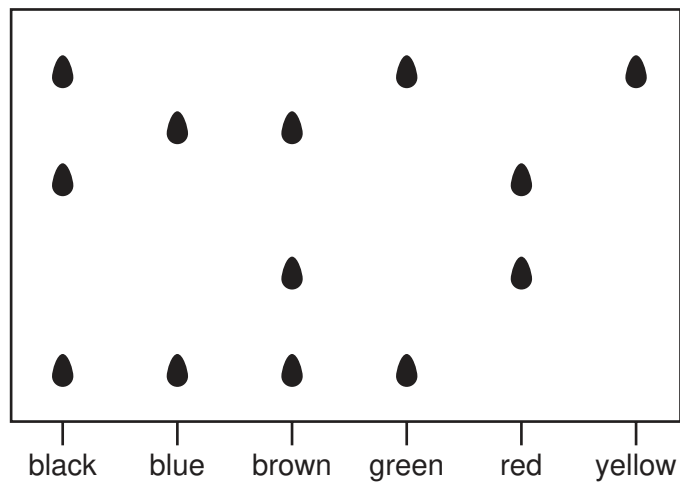
- 1 An inflated balloon goes down because gas molecules can diffuse through the rubber.

Four balloons are filled with different gases at the same temperature and pressure.

Which balloon would go down quickest?



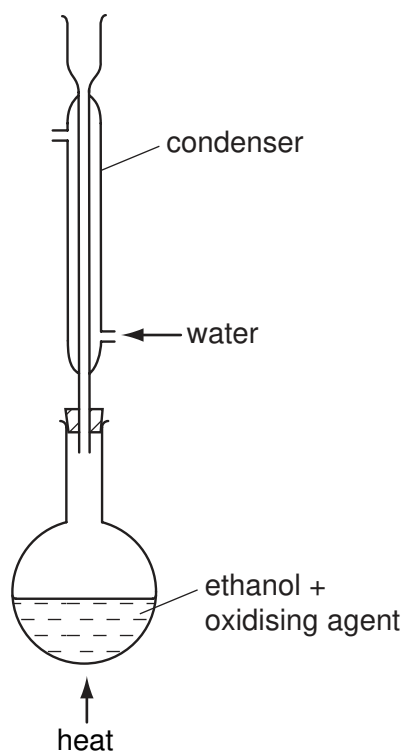
- 2 The diagram shows a chromatogram of several inks.



Which statement is correct?

- A** Black ink can be made by mixing green, red and yellow inks.
- B** Brown ink can be made by mixing blue and red inks.
- C** Yellow ink can be used to make brown ink.
- D** Yellow ink may be present in green ink.

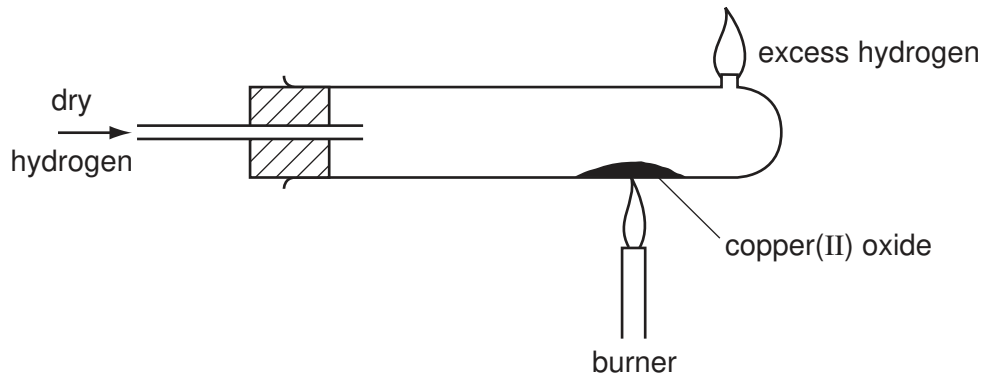
3 The oxidation of ethanol to ethanoic acid is often carried out in the apparatus shown.



What is the purpose of the condenser?

- A** to prevent air reacting with the ethanoic acid
- B** to prevent any ethanol from escaping
- C** to prevent the ethanoic acid changing back to ethanol
- D** to prevent the ethanoic acid reacting with the ethanol

- 4 The diagram shows copper(II) oxide being reduced, by hydrogen, to copper. After reduction is complete, the burner is turned off but the flow of hydrogen is continued until the tube is cool.



Why is the hydrogen allowed to flow through the tube during cooling?

- A to allow the tube to cool slowly
  - B to lessen the risk of explosion in the hot tube
  - C to prevent the copper from reacting with the air
  - D to remove any traces of water left in the tube
- 5 A coin is analysed by dissolving it in nitric acid. To the resulting solution an excess of aqueous ammonia is added and the mixture is filtered.

A brown precipitate remains in the filter paper and a deep blue solution is obtained as the filtrate.

Which metals does the coin contain?

- A aluminium and copper
  - B copper and iron
  - C iron and lead
  - D lead and zinc
- 6 An element X forms a positive ion with the electronic structure 2,8,8.

What is the proton (atomic) number of X?

- A 16
- B 17
- C 18
- D 19

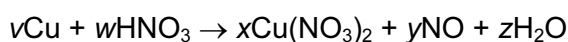
- 7 Which two substances are elements with a giant molecular structure?

- A diamond and graphite
- B diamond and sand
- C methane and iodine
- D methane and sand

- 8 Which compound has both ionic and covalent bonds?
- A ammonium chloride  
 B carbon dioxide  
 C ethyl ethanoate  
 D sodium chloride
- 9 Which statement about the numbers of particles in atoms is correct?

Apart from hydrogen, most atoms contain

- A more neutrons than protons.  
 B more protons than neutrons.  
 C more electrons than protons.  
 D more protons than electrons.
- 10 Which gas contains the same number of molecules as 9 g of water?
- A 2 g of hydrogen  
 B 14 g of nitrogen  
 C 32 g of oxygen  
 D 44 g of carbon dioxide
- 11 The equation for the reaction between copper and nitric acid is shown.



$v$ ,  $w$ ,  $x$ ,  $y$  and  $z$  are whole numbers.

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

	$v$	$w$	$x$	$y$	$z$
<b>A</b>	1	2	1	1	1
<b>B</b>	1	4	1	2	2
<b>C</b>	3	4	3	2	2
<b>D</b>	3	8	3	2	4

- 12 The mass of one mole of a chloride formed by a metal Y is 74.5 g.

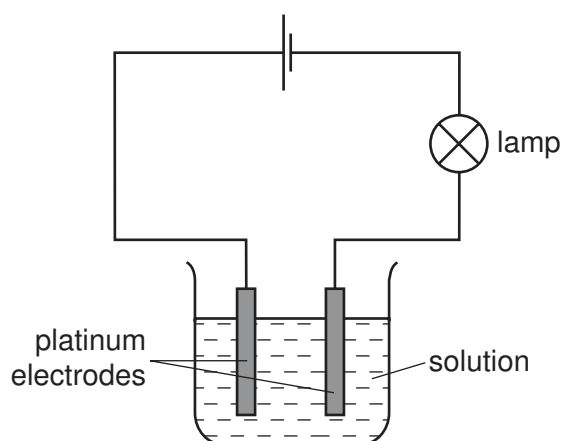
What is the formula of the chloride?

- A  $\text{Y}_3\text{Cl}$                       B  $\text{Y}_2\text{Cl}$                       C  $\text{YCl}$                       D  $\text{YCl}_2$

- 13 Which reactions take place during the electrolysis of aqueous copper(II) sulfate with copper electrodes?

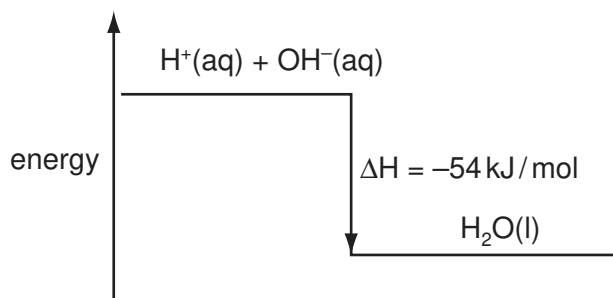
	reaction at positive electrode	reaction at negative electrode
<b>A</b>	$\text{Cu}^{2+} + 2\text{e}^{-} \rightarrow \text{Cu}$	$\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^{-}$
<b>B</b>	$4\text{OH}^{-} \rightarrow 2\text{H}_2\text{O} + \text{O}_2 + 4\text{e}^{-}$	$\text{Cu}^{2+} + 2\text{e}^{-} \rightarrow \text{Cu}$
<b>C</b>	$\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^{-}$	$2\text{H}^{+} + 2\text{e}^{-} \rightarrow \text{H}_2$
<b>D</b>	$\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^{-}$	$\text{Cu}^{2+} + 2\text{e}^{-} \rightarrow \text{Cu}$

- 14 The diagram shows apparatus used to investigate the conductivity of different solutions.



Which substance, in aqueous solution of concentration  $1 \text{ mol/dm}^3$ , would cause the lamp to give the brightest light?

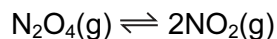
- A** ammonia  
**B** ethanoic acid  
**C** ethanol  
**D** sulfuric acid
- 15 The energy diagram for the reaction between sodium hydroxide and hydrochloric acid is shown.



Which quantity of heat is liberated when  $100 \text{ cm}^3$  of  $1 \text{ mol/dm}^3$  hydrochloric acid reacts with  $100 \text{ cm}^3$  of  $1 \text{ mol/dm}^3$  sodium hydroxide?

- A** 0.54 kJ      **B** 2.70 kJ      **C** 5.40 kJ      **D** 10.8 kJ

16 The equation shows a reversible reaction.



The forward reaction is endothermic.

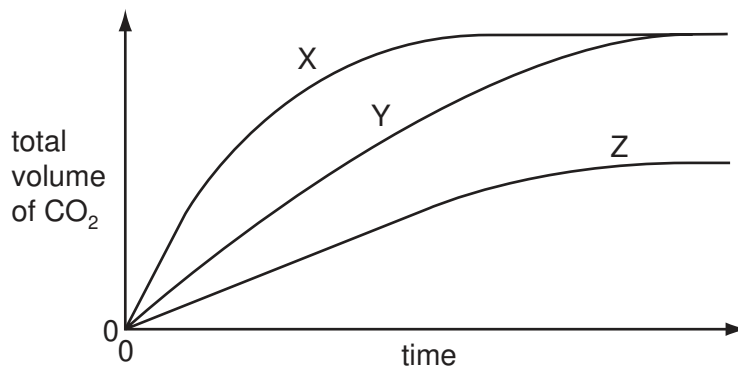
Which of these changes will increase the yield of  $\text{NO}_2$ ?

	pressure	temperature
<b>A</b>	decreased	decreased
<b>B</b>	decreased	increased
<b>C</b>	increased	decreased
<b>D</b>	increased	increased

17 In experiment 1, an excess of finely powdered marble is added to  $20 \text{ cm}^3$  of dilute hydrochloric acid.

In experiment 2, carried out under the same conditions of temperature and pressure, an excess of marble chips is added to  $20 \text{ cm}^3$  of dilute hydrochloric acid of the same concentration.

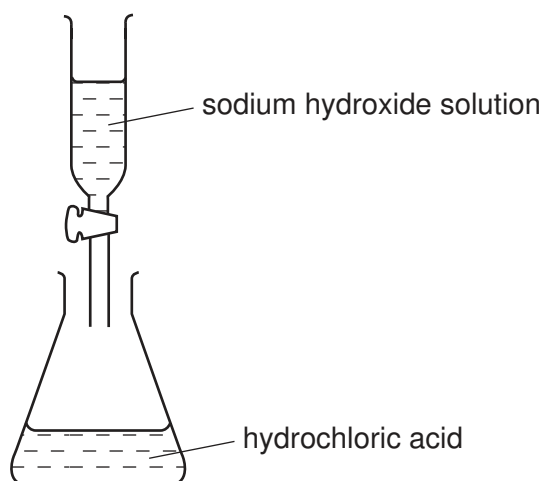
The total volumes of carbon dioxide given off are determined at intervals and plotted against time.



Which pair of curves is obtained in the two experiments?

	experiment 1	experiment 2
<b>A</b>	X	Z
<b>B</b>	X	Y
<b>C</b>	Y	Z
<b>D</b>	Y	X

- 18 What is **not** an example of oxidation?
- A converting iron(III) salts into iron(II) salts
  - B converting magnesium atoms into magnesium ions
  - C dissolving of a copper anode during electrolysis
  - D liberating chlorine from a chloride
- 19 Which metal has a soluble carbonate, chloride and sulfate?
- A barium
  - B calcium
  - C copper
  - D potassium
- 20 Sodium hydroxide solution was added to dilute hydrochloric acid. The pH of the solution in the flask was measured at intervals until no further change of pH took place.



What would be the pH change in this reaction?

- A decrease to 1
  - B decrease to 7
  - C increase to 7
  - D increase to 12
- 21 Why is nickel used in the addition of hydrogen to alkenes?
- A It increases the yield of products.
  - B It lowers the activation energy of the reaction.
  - C It makes the reaction more exothermic.
  - D It prevents a reverse reaction from occurring.



22 Caesium, Cs, is an element in Group I of the Periodic Table.

Which statements about Caesium are true?

- 1 Caesium conducts electricity both when solid and when molten.
- 2 Caesium reacts explosively with water.
- 3 Caesium reacts with water and forms a solution of  $\text{pH} < 7$ .

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

23 Elements with the code letters Q and R occupy the positions shown in the outline of the Periodic Table.

														<i>R</i>							
	<i>Q</i>																				

What is the formula of the compound formed between them?

- A**  $\text{QR}_2$                       **B**  $\text{Q}_2\text{R}$                       **C**  $\text{Q}_2\text{R}_3$                       **D**  $\text{Q}_3\text{R}_2$

24 The list shows some properties of metals.

- 1 Metals are good conductors of electricity.
- 2 Metals form ions by the loss of electrons.
- 3 Metals have high melting points.

Mercury is a metallic element.

Which of these statements do **not** apply to mercury?

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

- 25 In the electrolysis of aluminium oxide to extract pure aluminium a compound called cryolite is first added to the oxide.

What is the reason for adding the cryolite?

- A to reduce the corrosion of the carbon electrodes by oxygen
- B to reduce energy costs
- C to enable the aluminium ions and oxygen ions to move to the electrodes
- D to prevent the aluminium formed from being oxidised back to aluminium oxide

- 26 Iron is extracted from its ore haematite,  $\text{Fe}_2\text{O}_3$ , by a reduction process in the blast furnace.

Which equation for reactions in the blast furnace shows the formation of the reducing agent?

- A  $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
- B  $\text{CaO} + \text{SiO}_2 \rightarrow \text{CaSiO}_3$
- C  $\text{CO}_2 + \text{C} \rightarrow 2\text{CO}$
- D  $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$

- 27 The steel bodies of cars can be protected from rusting by spraying them with zinc.

Why is zinc used?

- A Zinc does not react with acidic exhaust fumes.
- B Zinc forms a stable compound with iron.
- C Zinc has a high melting point.
- D Zinc is higher in the reactivity series than iron.

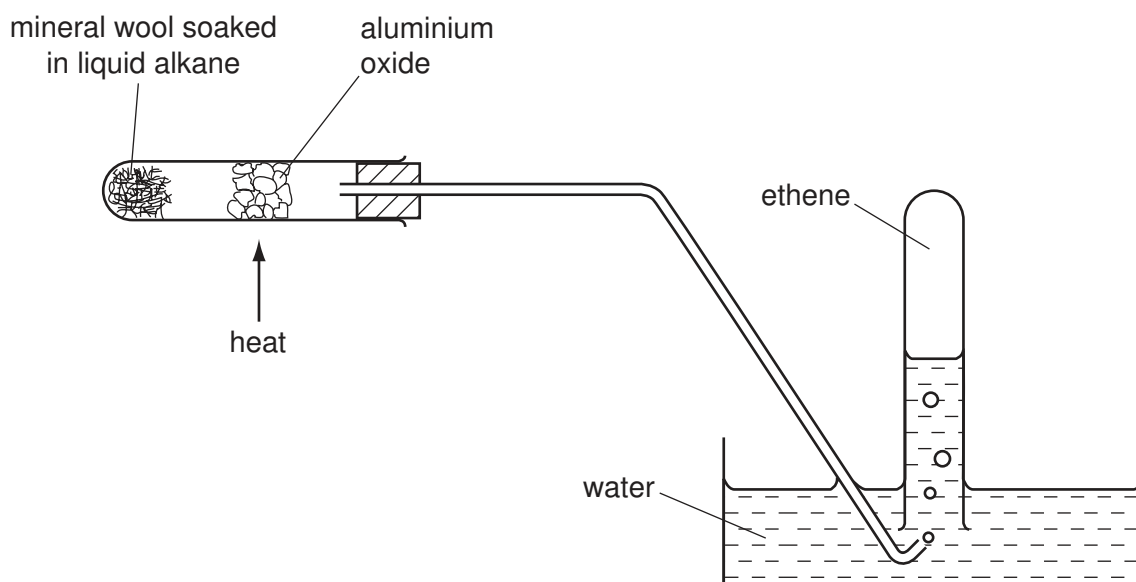
- 28 Solid Y is insoluble in water. It gives off a gas when heated and also when reacted with dilute sulfuric acid.

What is Y?

- A copper(II) carbonate
- B sodium carbonate
- C sodium nitrate
- D zinc oxide

- 29 What is the **ionic** equation for the reaction between zinc and aqueous copper(II) sulfate?
- A  $\text{Zn}^{2+}(\text{aq}) + \text{Cu}(\text{s}) \rightarrow \text{Zn}(\text{s}) + \text{Cu}^{2+}(\text{aq})$
  - B  $\text{Zn}^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{ZnSO}_4(\text{s})$
  - C  $\text{Zn}(\text{s}) + \text{CuSO}_4(\text{aq}) \rightarrow \text{ZnSO}_4(\text{aq}) + \text{Cu}(\text{s})$
  - D  $\text{Zn}(\text{s}) + \text{Cu}^{2+}(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + \text{Cu}(\text{s})$
- 30 Which gas reacts with sulfuric acid to form a fertiliser?
- A ammonia,  $\text{NH}_3$
  - B carbon dioxide,  $\text{CO}_2$
  - C hydrogen,  $\text{H}_2$
  - D nitrogen,  $\text{N}_2$
- 31 In the Contact process, the sulfur trioxide formed is
- A passed into concentrated sulfuric acid.
  - B passed into dilute sulfuric acid.
  - C passed into oleum ( $\text{H}_2\text{S}_2\text{O}_7$ ).
  - D passed into water.
- 32 Which gas, present in pond water, decreases in concentration during eutrophication?
- A carbon dioxide
  - B methane
  - C nitrogen
  - D oxygen
- 33 Methane is a greenhouse gas.
- Which process releases methane into the air?
- A combustion of petrol
  - B decay of vegetable matter
  - C photosynthesis
  - D volcanic activity

- 34 Carbon dioxide and carbon monoxide are both
- A absorbed by sodium hydroxide.
  - B colourless.
  - C inflammable in air.
  - D lighter than air.
- 35 Which hydrocarbon will burn completely in oxygen to give equal numbers of moles of carbon dioxide and water?
- A  $C_2H_6$
  - B  $C_3H_6$
  - C  $C_4H_{10}$
  - D  $C_5H_{12}$
- 36 The diagram shows the breakdown of an alkane to ethene.



The ethene is then tested with aqueous bromine.

Which information about ethene is correct?

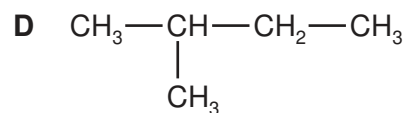
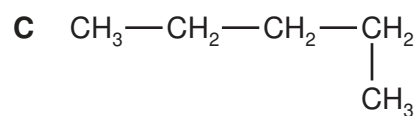
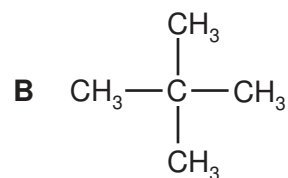
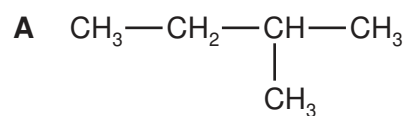
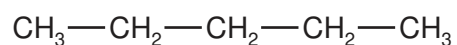
	solubility of ethene gas	action on aqueous bromine
<b>A</b>	insoluble	decolourised
<b>B</b>	insoluble	no reaction
<b>C</b>	soluble	decolourised
<b>D</b>	soluble	no reaction

37 Carbohydrates, proteins, fats and *Terylene* are macromolecules.

Which element is found **in only one** of these macromolecules?

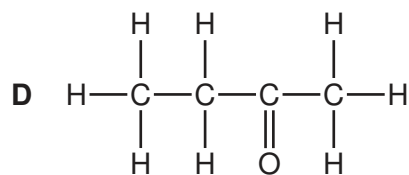
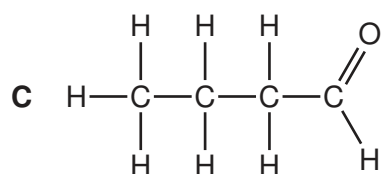
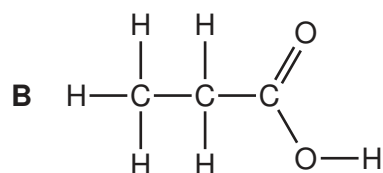
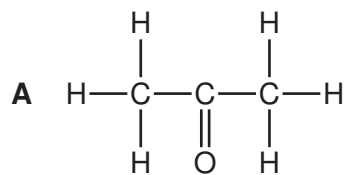
- A carbon
- B hydrogen
- C nitrogen
- D oxygen

38 Which structure is **not** an isomer of the structure shown?

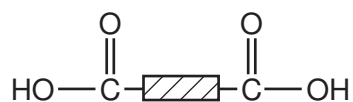


39 Alcohols can be oxidised to form another homologous series of compounds.

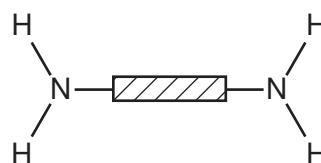
What would be the product of the oxidation of propanol?



40 A polymer X is hydrolysed and the two products are



and



What can be deduced about X?

- A** It is a condensation polymer.
- B** It is made by addition polymerisation.
- C** It is starch.
- D** It is *Terylene*.



**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	27 <b>Al</b> Aluminium 13	28 <b>Si</b> Silicon 14	31 <b>P</b> Phosphorus 15	32 <b>S</b> Sulphur 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	56 <b>Fe</b> Iron 26	55 <b>Mn</b> Manganese 25	59 <b>Co</b> Cobalt 27	59 <b>Ni</b> Nickel 28	64 <b>Cu</b> Copper 29	70 <b>Ga</b> Gallium 31	73 <b>Ge</b> Germanium 32	75 <b>As</b> Arsenic 33	79 <b>Se</b> Selenium 34	80 <b>Br</b> Bromine 35	84 <b>Kr</b> Krypton 36		
85 <b>Rb</b> Rubidium 37	88 <b>Sr</b> Strontium 38	101 <b>Ru</b> Ruthenium 44	101 <b>Rh</b> Rhodium 45	103 <b>Rh</b> Rhodium 45	106 <b>Pd</b> Palladium 46	108 <b>Ag</b> Silver 47	112 <b>Cd</b> Cadmium 48	115 <b>In</b> Indium 49	119 <b>Sn</b> Tin 50	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	186 <b>Os</b> Osmium 76	186 <b>Re</b> Rhenium 75	184 <b>W</b> Tungsten 74	192 <b>Ir</b> Iridium 77	195 <b>Pt</b> Platinum 78	201 <b>Hg</b> Mercury 80	204 <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		
226 <b>Fr</b> Francium 87	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	157 <b>Gd</b> Gadolinium 64	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
232 <b>Th</b> Thorium 90	238 <b>Pa</b> Protactinium 91	238 <b>U</b> Uranium 92	238 <b>Pu</b> Plutonium 94	95 <b>Am</b> Americium 95	96 <b>Cm</b> Curium 96	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

a	<b>X</b>	b
Key	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.).

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

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