

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CHEMISTRY

5070/01

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 16.

You may use a calculator.

This document consists of **14** printed pages and **2** blank pages.

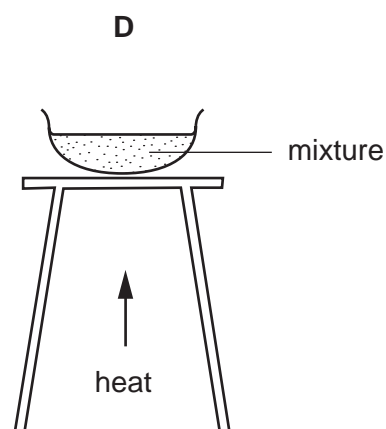
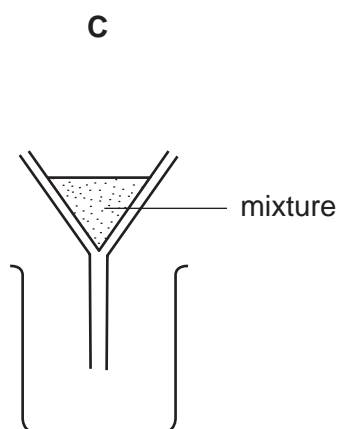
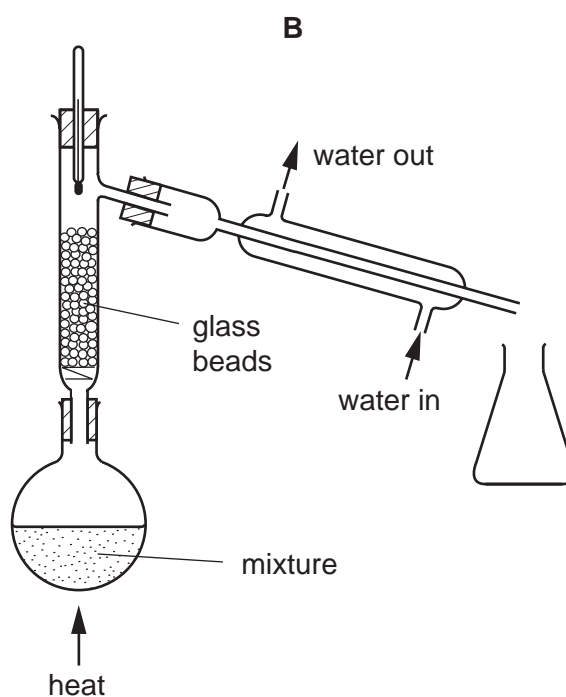
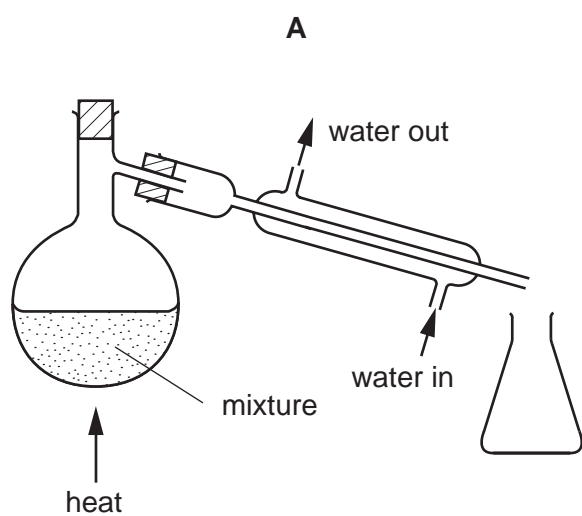


1 Which of the following is a pure compound?

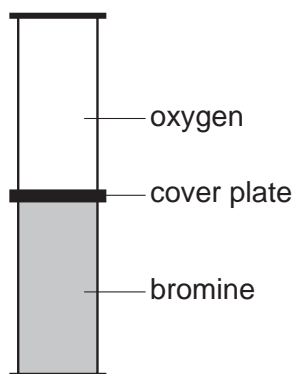
- A ethanol
- B petrol
- C steel
- D tap water

2 Substance **X** melts at 53°C and boils at 100°C . It does not dissolve in water and it does not react with water.

Which diagram shows the method most suitable for separating **X** from a mixture of **X** and water?

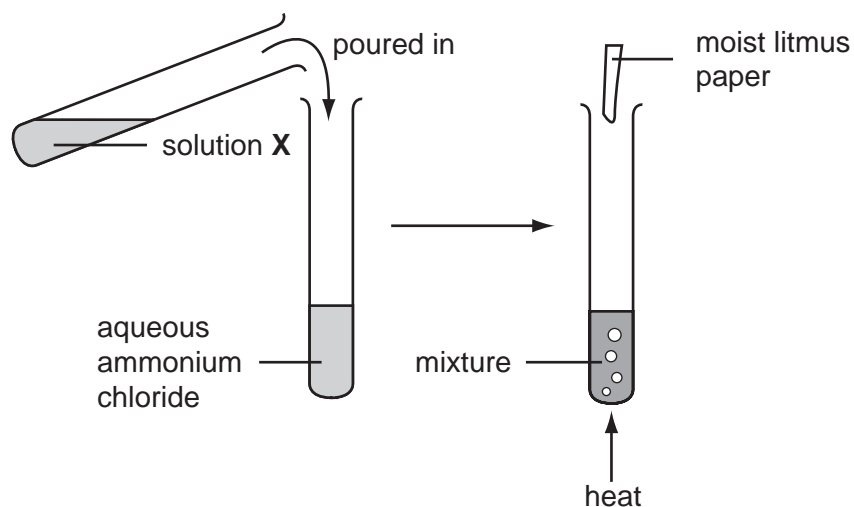


- 3 The coverplate is removed from the gas jars shown in the diagram. After several days, the colour of the gas is the same in both jars.



Which statement explains this change?

- A** Oxygen and bromine gases have equal densities.
B Oxygen and bromine molecules are in random motion.
C Oxygen and bromine molecules diffuse at the same rate.
D Equal volumes of oxygen and bromine contain equal numbers of molecules.
- 4 The diagrams show an experiment with aqueous ammonium chloride.



A gas, **Y**, is produced and the litmus paper changes colour.

What are solution **X** and gas **Y**?

	solution X	gas Y
A	aqueous sodium hydroxide	ammonia
B	aqueous sodium hydroxide	chlorine
C	dilute sulphuric acid	ammonia
D	dilute sulphuric acid	chlorine

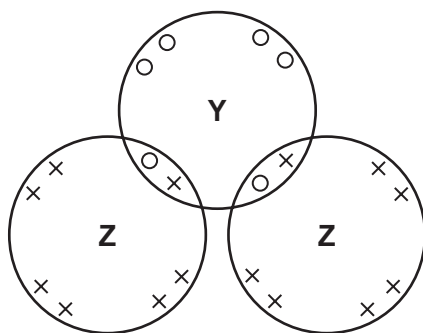
5 Which two gases each change the colour of damp red litmus paper?

- A ammonia and chlorine
- B ammonia and hydrogen chloride
- C carbon dioxide and chlorine
- D carbon dioxide and sulphur dioxide

6 The atoms $^{31}_{15}\text{P}$ and $^{32}_{16}\text{S}$ have the same

- A nucleon number.
- B number of electrons.
- C number of neutrons.
- D number of protons.

7 The diagram shows the arrangement of electrons in a molecule of compound YZ_2 .



key

- outer electron of a Y atom
- × outer electron of a Z atom

What are elements Y and Z?

	Y	Z
A	calcium	chlorine
B	carbon	oxygen
C	oxygen	hydrogen
D	sulphur	chlorine

8 Which **two** statements about a covalent bond are correct?

- 1 It can be formed between two metal atoms.
- 2 It can be formed between two non-metal atoms.
- 3 It is formed by the transfer of electrons between atoms.
- 4 It is formed by sharing electrons between atoms.

- A 1 and 3
- B 1 and 4
- C 2 and 3
- D 2 and 4

- 9 Which statement explains why sodium chloride, NaCl , has a lower melting point than magnesium oxide, MgO ?
- A Sodium chloride is covalent but magnesium oxide is ionic.
- B Sodium is more reactive than magnesium.
- C The attraction between Na^+ and Cl^- is weaker than that between Mg^{2+} and O^{2-} .
- D The melting point of sodium is lower than that of magnesium.
- 10 Four substances have the following electrical properties.

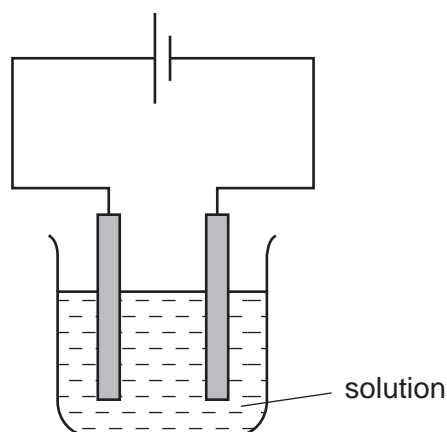
substance	property
W	does not conduct under any conditions
X	conducts only in aqueous solution
Y	conducts in both the molten and solid states
Z	conducts in both the molten and aqueous states

What are these four substances?

	W	X	Y	Z
A	HCl	S	NaCl	Pb
B	Pb	HCl	NaCl	S
C	S	HCl	Pb	NaCl
D	S	NaCl	HCl	Pb

- 11 What is the ratio of the volume of 2 g of hydrogen to the volume of 16 g of methane, both volumes at r.t.p.?
- A 1 to 1 B 1 to 2 C 1 to 8 D 2 to 1

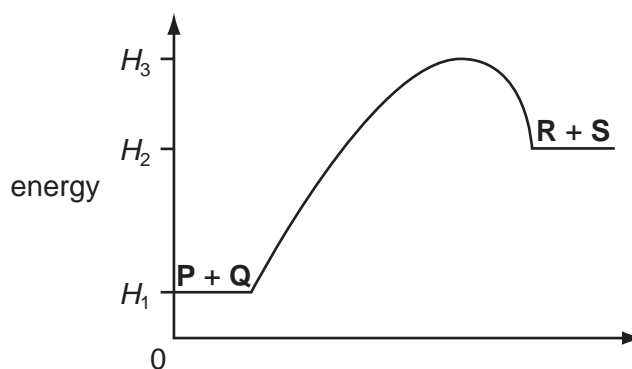
- 12 The diagram shows the electrolysis of a concentrated aqueous solution containing both copper(II) ions and sodium ions.



Which metal is deposited at the negative electrode and why?

	metal deposited	reason
A	copper	copper is less reactive than sodium
B	copper	copper is more reactive than hydrogen
C	sodium	copper is less reactive than hydrogen
D	sodium	copper is more reactive than sodium

- 13 The energy profile diagram below is for a reaction $P + Q \rightarrow R + S$.

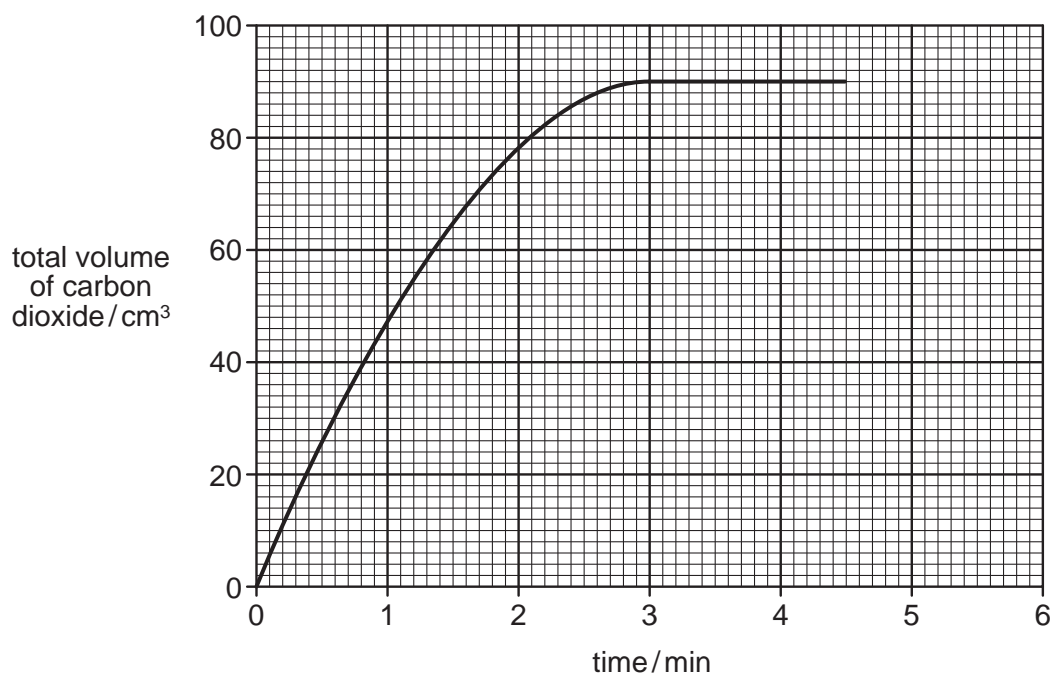


Which statement is correct?

- A** The activation energy of the reaction is $(H_3 - H_1)$.
B The activation energy of the reaction is $(H_3 - H_2)$.
C ΔH is $(H_1 - H_2)$.
D ΔH is $(H_1 - H_3)$.

- 14** The rate of the reaction between a given mass of calcium carbonate and an excess of hydrochloric acid is studied by collecting the carbon dioxide in a graduated syringe.

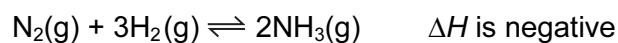
The results are shown in the graph.



How much time is required for half the calcium carbonate to react?

- A** 0.95 min **B** 1.5 min **C** 2.0 min **D** 3.0 min
- 15** Ammonia is made by a reversible reaction between nitrogen and hydrogen.

The equation for the reaction is shown.



What is the effect of increasing the pressure in this process?

- A** Less ammonia is formed.
B Less heat is produced.
C More ammonia is formed.
D The reaction slows down.

- 16 Separate samples of hydrogen peroxide are added to aqueous potassium iodide and to acidified potassium dichromate(VI). The iodide ions are oxidised and dichromate(VI) ions are reduced.

What colour changes are seen?

	potassium iodide	acidified potassium dichromate(VI)
A	colourless to brown	purple to colourless
B	brown to colourless	purple to colourless
C	colourless to brown	orange to green
D	brown to colourless	orange to green

- 17 In which line in the table is **all** the information correct?

	reaction at electrode	electrode	product
A	$2X^- \rightarrow X_2 + 2e^-$	cathode	metal
B	$X^+ + e^- \rightarrow X$	anode	metal
C	$2X^- \rightarrow X_2 + 2e^-$	anode	non-metal
D	$X^+ + e^- \rightarrow X$	cathode	non-metal

- 18 Which two reagents could be used to prepare the insoluble salt copper(II) carbonate?

- A** $\text{CuO(s)} + \text{Na}_2\text{CO}_3\text{(aq)}$
- B** $\text{CuO(s)} + \text{MgCO}_3\text{(s)}$
- C** $\text{CuSO}_4\text{(aq)} + \text{Na}_2\text{CO}_3\text{(aq)}$
- D** $\text{CuSO}_4\text{(aq)} + \text{MgCO}_3\text{(s)}$

- 19 Which statement does **not** describe a property of a weak acid in solution?

- A** It forms a salt with sodium hydroxide.
- B** It has a pH of between 8 and 9.
- C** It is only partly dissociated into ions.
- D** It reacts with sodium carbonate to give off carbon dioxide.

- 20 Which products are formed when dilute hydrochloric acid reacts with the substances shown in the table?

	substance	products
A	iron	iron(II) chloride + hydrogen only
B	iron(II) carbonate	iron(II) chloride + carbon dioxide gas only
C	iron(II) oxide	iron(II) chloride + oxygen gas only
D	iron(II) sulphate	iron(II) chloride + sulphur dioxide only

- 21 Which pollutant increases the growth of algae in rivers and streams?

- A** chlorine
B heavy metal ions
C nitrate ions
D sulphur dioxide

- 22 When chlorine water is added to a colourless solution of **X**, a dark brown solution is obtained.

What is **X**?

- A** KCl **B** KI **C** $NaBr$ **D** NaF

- 23 Many properties of an element and its compounds can be predicted from the position of the element in the Periodic Table.

What property could **not** be predicted in this way?

- A** the acidic or basic nature of its oxide
B the formula of its oxide
C the number of isotopes it has
D its metallic or non-metallic properties

- 24 The element with a proton number 12 has similar chemical properties to the element with the proton number

- A** 2. **B** 11. **C** 13. **D** 20.

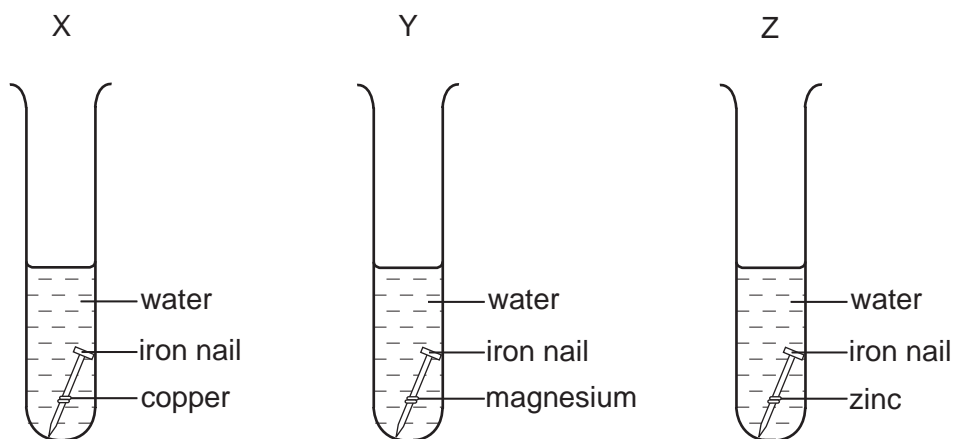
- 25 What is the mass of aluminium in 204 g of aluminium oxide, Al_2O_3 ?

- A** 26 g **B** 27 g **C** 54 g **D** 108 g

26 Which process does **not** result in the formation of **both** carbon dioxide and water?

- A addition of a dilute acid to a carbonate
- B burning ethanol
- C burning methane
- D heating crystals of hydrated sodium carbonate

27 Experiments are set up to investigate the sacrificial protection of iron.



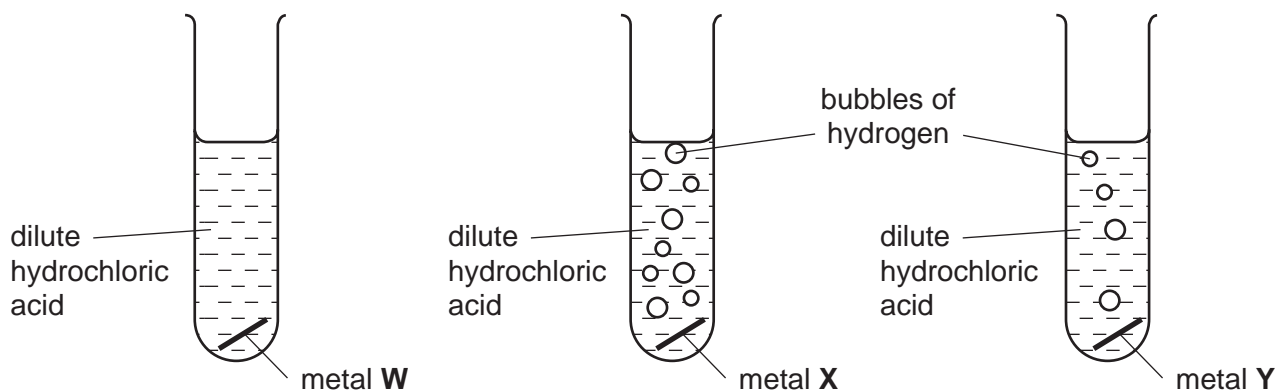
In which test-tubes will the iron rust?

- A X only
 - B Y only
 - C X and Z only
 - D Y and Z only
- 28 One mole of compound **X** gives three moles of ions in aqueous solution. **X** reacts with ammonium carbonate to give an acidic gas.

What is compound **X**?

- A calcium hydroxide
- B ethanoic acid
- C sodium hydroxide
- D sulphuric acid

29 The diagrams show the reactions of three different metals with dilute hydrochloric acid.



What are metals **W**, **X** and **Y**?

	W	X	Y
A	copper	magnesium	zinc
B	copper	zinc	magnesium
C	magnesium	zinc	copper
D	zinc	magnesium	copper

30 Which statements about the pollutant carbon monoxide are correct?

- 1 It is a colourless, odourless gas.
- 2 It is formed by incomplete combustion of natural gas.
- 3 It reacts with haemoglobin in the blood.

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

31 Which gas is **not** produced when hydrocarbons are burnt in the internal combustion engine?

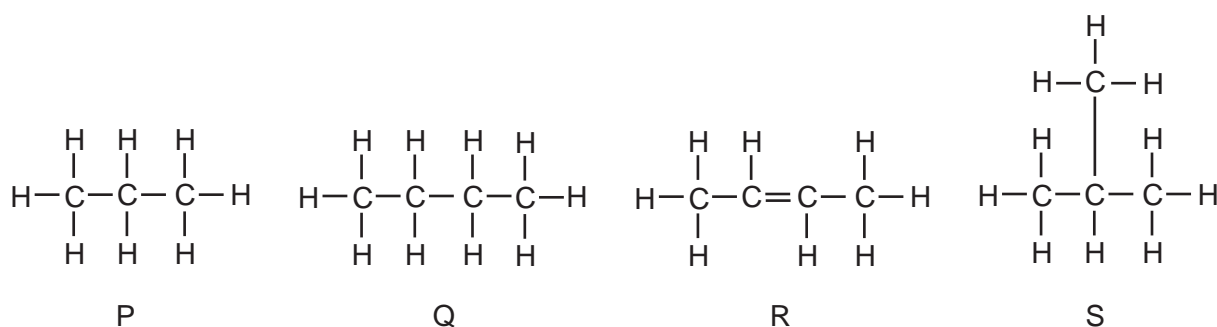
- A** carbon dioxide
B carbon monoxide
C hydrogen
D nitrogen oxides

32 Cholesterol is an organic molecule that occurs in the blood stream.

What type of compound is cholesterol?

- A an acid
- B an alcohol
- C an alkane
- D an alkene

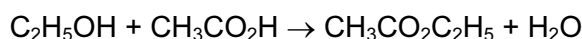
33 The diagrams show four hydrocarbons P, Q, R and S.



Which two hydrocarbons are isomers of each other?

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

34 When ethanol reacts with ethanoic acid, the ester ethyl ethanoate is formed.



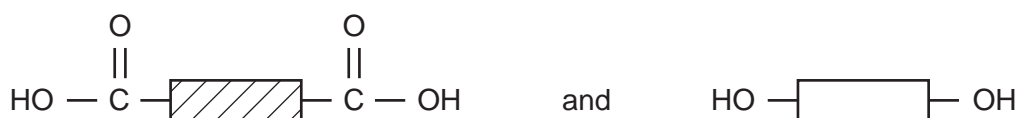
What is the formula of the ester formed when methanol reacts with butanoic acid ($\text{C}_3\text{H}_7\text{CO}_2\text{H}$)?

- A $\text{C}_2\text{H}_5\text{CO}_2\text{C}_2\text{H}_5$
- B $\text{C}_3\text{H}_7\text{CO}_2\text{C}_2\text{H}_5$
- C $\text{CH}_3\text{CO}_2\text{C}_3\text{H}_7$
- D $\text{C}_3\text{H}_7\text{CO}_2\text{CH}_3$

35 Which of these polymers is a protein?

- A $(\text{C}_2\text{H}_3\text{Cl})_n$
- B $(\text{C}_2\text{H}_3\text{NO})_n$
- C $(\text{C}_5\text{H}_8\text{O}_2)_n$
- D $(\text{C}_6\text{H}_{10}\text{O}_5)_n$

- 36 Which natural resource is being depleted by the manufacture of plastics?
- A air
 - B fossil fuels
 - C metal ores
 - D water
- 37 Which statement is true about ethanol?
- A It is formed by the catalytic addition of steam to ethene.
 - B It is an unsaturated compound.
 - C It is formed by the oxidation of ethanoic acid.
 - D It reacts with ethyl ethanoate to form an acid.
- 38 Which element is **least** likely to be found in a macromolecule?
- A carbon
 - B hydrogen
 - C oxygen
 - D sodium
- 39 What is the catalyst used in the preparation of ethyl ethanoate from ethanol and ethanoic acid?
- A concentrated sulphuric acid
 - B nickel
 - C vanadium(V) oxide
 - D yeast
- 40 A macromolecule is made from the two monomer molecules shown below.



What is the macromolecule?

- A a carbohydrate
- B a polyamide
- C a polyester
- D a protein

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DATA SHEET
The Periodic Table of the Elements

		Group																																	
		I	II	III	IV	V	VI	VII	VIII	IX	X																								
1	1																																		
7	3	9																																	
Li Lithium	Be Beryllium																																		
23	11	24																																	
Na Sodium	Mg Magnesium																																		
39	19	40	20	45	21	48	22	51	23	52	24	55	25	56	26	59	27	64	29	65	30	70	31	73	32	75	33	77	34	79	35	80	84	36	86
K Potassium	Ca Calcium	Sc Scandium	Ti Titanium	V Vanadium	Cr Chromium	Mn Manganese	Fe Iron	Co Cobalt	Ni Nickel	Cu Copper	Zn Zinc	Ga Gallium	Ge Germanium	As Arsenic	Se Selenium	Br Bromine	Kr Krypton																		
85	37	88	38	89	39	91	40	93	41	96	42	99	43	101	44	106	46	108	47	112	48	115	49	119	50	122	51	127	53	131	54				
Rb Rubidium	Sr Strontium	Y Yttrium	Zr Zirconium	Nb Niobium	Mo Molybdenum	Tc Technetium	Ru Ruthenium	Rh Rhodium	Pd Palladium	Ag Silver	Cd Cadmium	In Indium	Sn Tin	Sb Antimony	Te Tellurium	I Iodine	Xe Xenon																		
133	55	137	56	181	73	186	75	190	76	192	77	195	78	197	79	201	80	204	81	207	82	209	83	210	84	210	85	210	86						
Cs Caesium	Ba Barium	La Lanthanum	Hf Hafnium	Ta Tantalum	W Tungsten	Re Rhenium	Os Osmium	Ir Iridium	Pt Platinum	Au Gold	Hg Mercury	Tl Thallium	Pb Lead	Bi Bismuth	Po Polonium	At Astatine	Rn Radon																		
Fr Francium	Ra Radium	Ac Actinium																																	

*58-71 Lanthanoid series
90-103 Actinoid series

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

a	X
b	

Key

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