

CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CHEMISTRY

5070/01

Paper 1 Multiple Choice

October/November 2003

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 20.

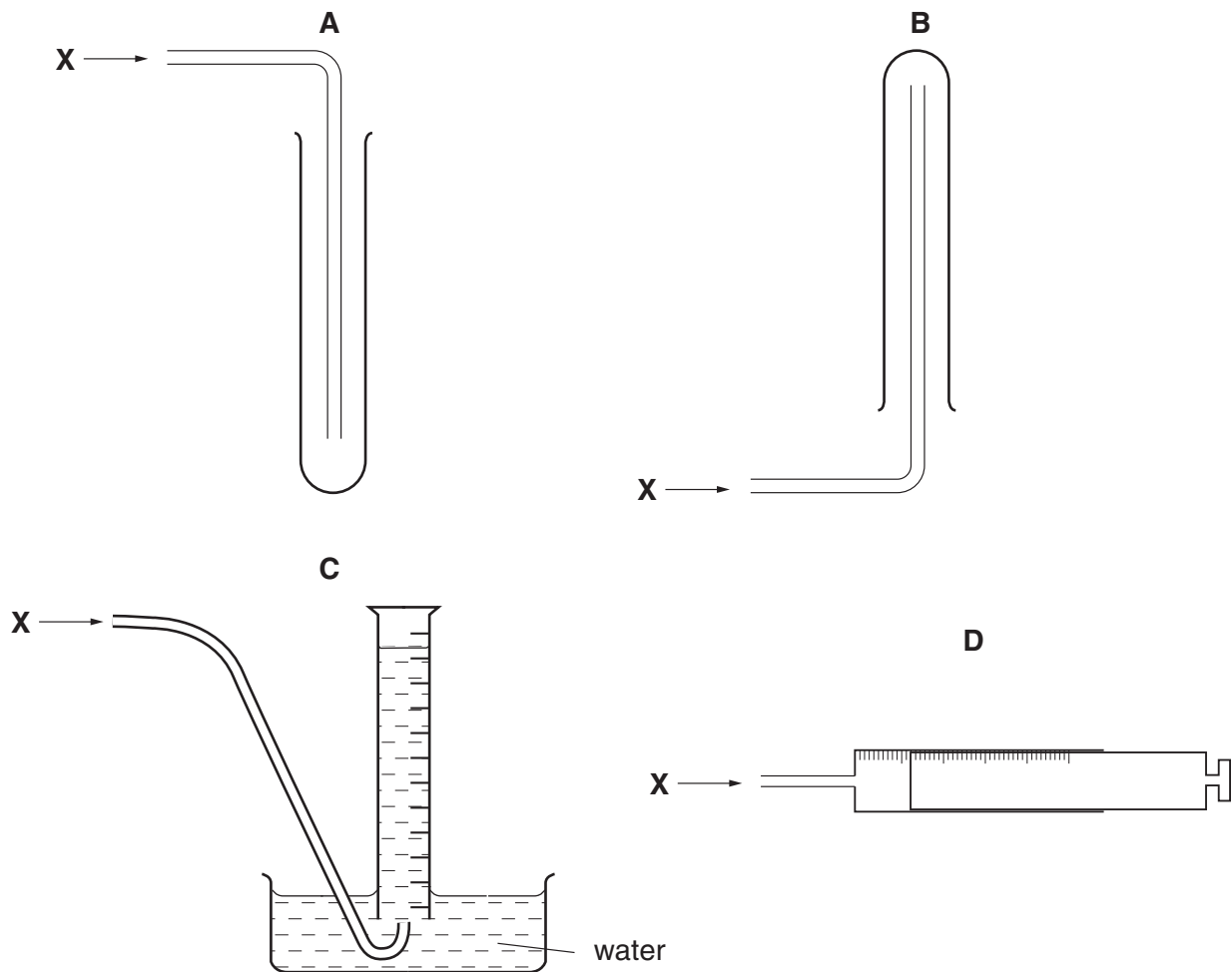
This document consists of **18** printed pages and **2** blank pages.

1 What is the most suitable way of investigating the different food colourings in some drinks?

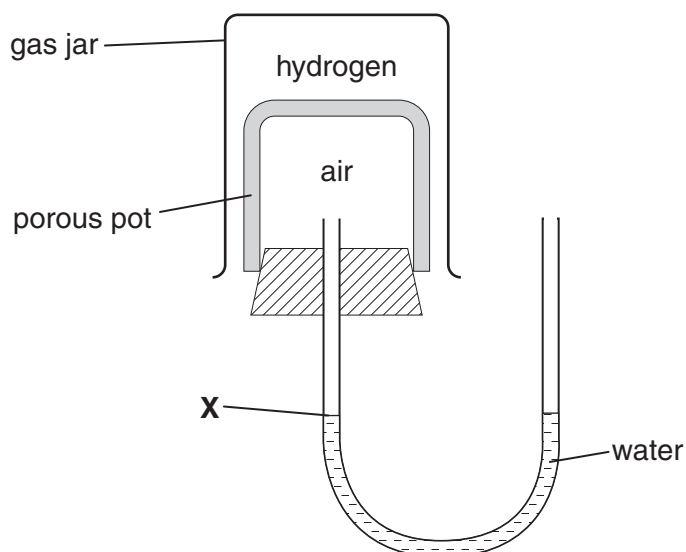
- A crystallisation
- B filtration
- C fractional distillation
- D paper chromatography

2 A gas, **X**, is less dense than air and insoluble in water.

Which method **cannot** be used to collect the gas?



- 3 The apparatus shown in the diagram was set up.



Over a period of time how will the water level at **X** change?

- A** It will fall, then rise and return to **X**.
B It will fall and remain at a lower level.
C It will rise, then fall then return to **X**.
D It will rise and remain at a higher level.
- 4 A salt is dissolved in water. The results of two separate tests on it are shown in the table.

	test	result
1	add aqueous ammonia	a white precipitate which dissolves when an excess of aqueous ammonia is added
2	add dilute nitric acid then aqueous barium nitrate	a white precipitate

What is the salt?

- A** aluminium chloride
B aluminium sulphate
C zinc chloride
D zinc sulphate

- 5 A researcher notices that atoms of an element **X** are releasing energy.

Why does this happen?

- A The atoms are affected by light.
 - B The atoms are radioactive.
 - C The atoms react with argon in the air.
 - D The atoms are evaporating.
- 6 An atom of element **X** is represented by ${}^7_3\text{X}$.
- Which statement about an atom of **X** is correct?
- A It is in Group III of the Periodic Table.
 - B It is in Group VII of the Periodic Table.
 - C The total number of protons and electrons is 6.
 - D The total number of protons and neutrons is 10.
- 7 In which pair of substances, does each have a giant molecular structure?
- A diamond, iodine
 - B diamond, silica (sand)
 - C iodine, methane
 - D methane, silica (sand)
- 8 In which substance is each carbon atom **covalently** bonded to only three other atoms?
- A carbon dioxide
 - B diamond
 - C graphite
 - D methane

9 How many electrons are shared in the covalent bonding of a methane molecule?

- A 2
 B 4
 C 6
 D 8

10 The table gives information about the ability of four substances to conduct electricity.

substance	
W	does not conduct under any conditions
X	conducts only in aqueous solution
Y	conducts when molten and when solid
Z	conducts when molten and when in aqueous solution

What could these four substances be?

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

11 What is the mass of magnesium which completely reacts with 250 cm³ of 1.0 mol/dm³ sulphuric acid?

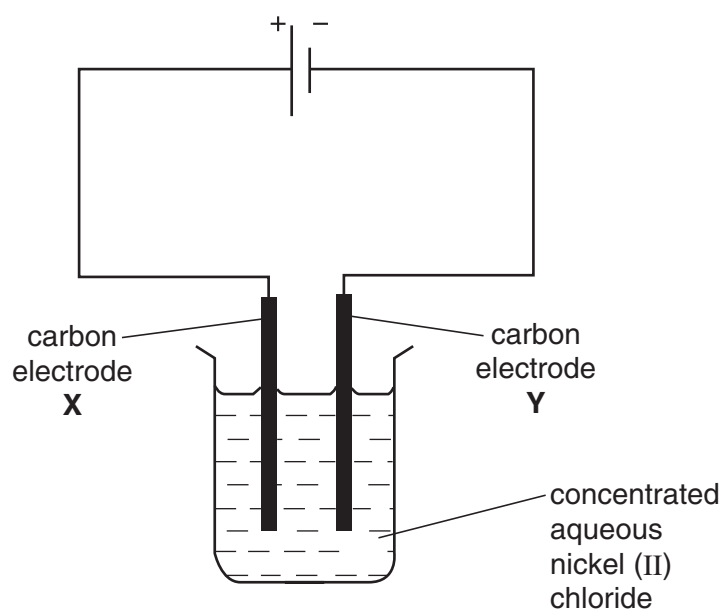
- A 6 g B 12 g C 48 g D 96 g

12 A volume of ethane, C₂H₆, at r.t.p. has a mass of 20 g.

What is the mass of an equal volume of propene, C₃H₆, at r.t.p.?

- A 20 g B 21 g C 28 g D 42 g

13 Apparatus is set up as shown in the diagram.

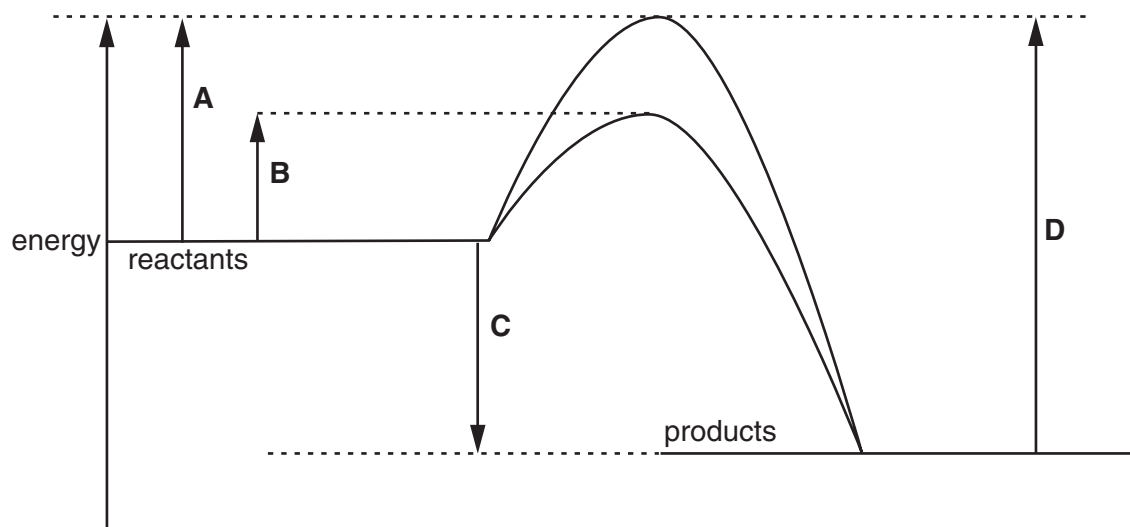


What occurs at electrode **X**?

- A Chloride ions are oxidised.
 - B Chloride ions are reduced.
 - C Nickel ions are oxidised.
 - D Nickel is deposited.
- 14 Which of the following, when added to water, makes a solution that is a good conductor of electricity?
- A calcium carbonate
 - B copper
 - C ethanol
 - D sodium hydroxide

15 The diagram shows an energy profile diagram for a chemical reaction.

Which energy change is the activation energy for the catalysed reaction?



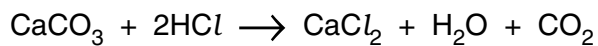
16 The formation of hydrogen iodide from hydrogen and iodine is an endothermic reaction.



What may be deduced from this information?

- A The number of bonds broken is greater than the number of bonds formed.
- B The formation of H – I bonds absorbs energy.
- C The products possess less energy than the reactants.
- D The total energy change in bond formation is less than that in bond breaking.

- 17 Calcium carbonate was reacted with an excess of dilute hydrochloric acid at room temperature.

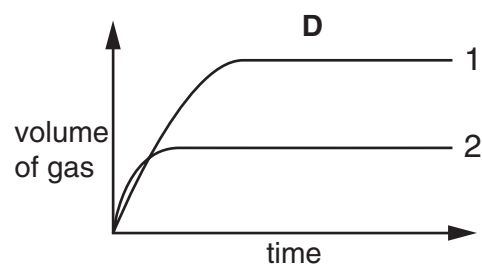
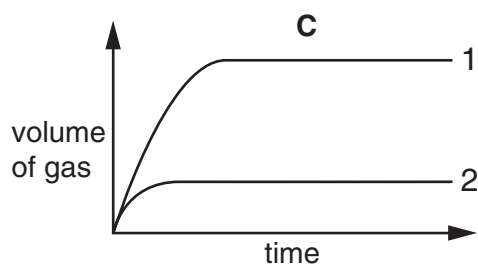
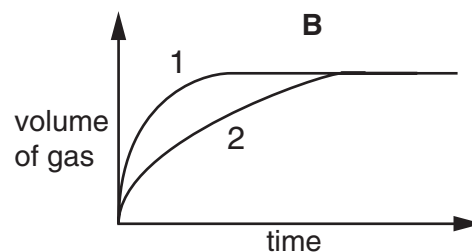
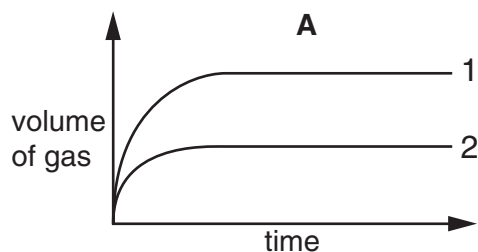


Two experiments were carried out.

Experiment 1 100 g of calcium carbonate in large lumps.

Experiment 2 50 g of calcium carbonate as a fine powder.

Which of the graphs is correct?



- 18 When acidified potassium manganate(VII) is reduced, which colour change occurs?

- A from colourless to purple
- B from green to orange
- C from orange to green
- D from purple to colourless

19 The pH of an aqueous solution of hydrochloric acid is 2.

What will be the pH of the acid after the addition of 10 g of sodium chloride?

- A 1
- B 2
- C 7
- D 9

20 An acid, **X**, was added to a solution of the nitrate of metal **Y**. A dense white precipitate was formed.

What are **X** and **Y**?

	acid X	metal Y
A	hydrochloric	calcium
B	nitric	zinc
C	sulphuric	aluminium
D	sulphuric	barium

21 Aluminium sulphate is used in water treatment. Aqueous aluminium sulphate is acidic.

The table shows the results of tests on four different samples of treated water.

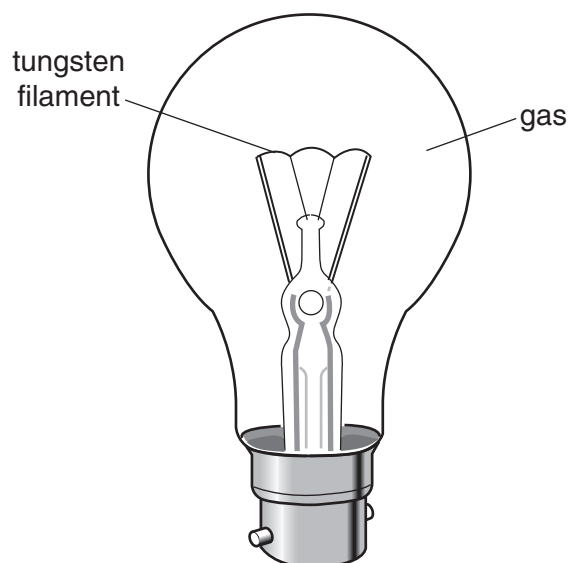
To which sample had an excess of aluminium sulphate been added?

sample	pH of sample	reaction with an excess of aqueous ammonia
A	3	white precipitate
B	3	no reaction
C	7	no reaction
D	11	white precipitate

22 Which statement about the alkali metals is true?

- A they form covalent bonds with Group VII elements
- B they form oxides on reacting with water
- C their melting points decrease on descending Group I
- D their reactivities decrease on descending Group I

23 Which gas is present in the light bulb?



- A argon
- B krypton
- C nitrogen
- D oxygen

24 Which shows the correct catalyst for each industrial process?

	manufacture of sulphuric acid	manufacture of ammonia	manufacture of margarine
A	nickel	iron	vanadium(V) oxide
B	nickel	vanadium(V) oxide	iron
C	vanadium(V) oxide	iron	nickel
D	vanadium(V) oxide	nickel	iron

25 Which statement is **not** a reason for the importance of recycling aluminium?

- A Aluminium is a rare metal in the Earth's crust.
- B The demand for aluminium continues to rise annually.
- C The extraction of aluminium from its ore is expensive.
- D The properties of aluminium make it one of the most useful of all metals.

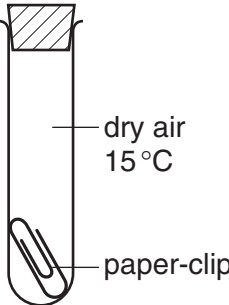
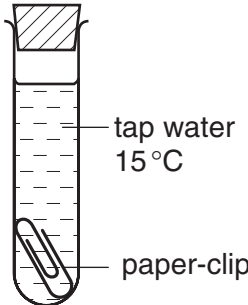
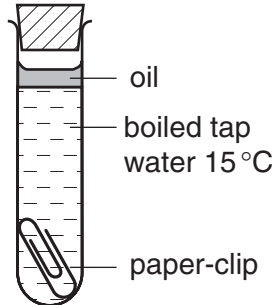
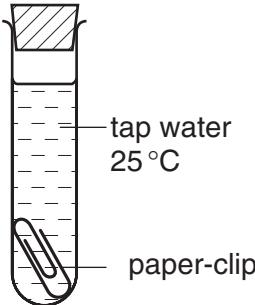
26 Three types of steel have different properties.

steel 1	easily shaped
steel 2	brittle
steel 3	resistant to corrosion

What are the names of these three types of steel?

	steel 1	steel 2	steel 3
A	high carbon	mild	stainless
B	high carbon	stainless	mild
C	mild	high carbon	stainless
D	mild	stainless	high carbon

27 Four experiments on rusting are shown.

1	2	3	4
			
not rusty after 1 week	rusts after 1 week	not rusty after 1 week	rusts after 1 week

Which two experiments can be used to show that air is needed for iron to rust?

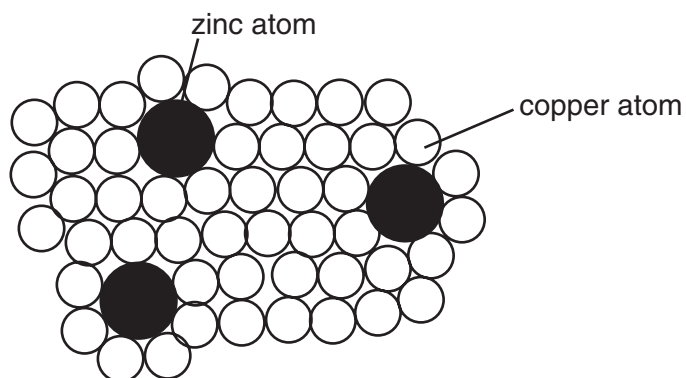
- A 1 and 3
- B 1 and 4
- C 2 and 3
- D 2 and 4

- 28 The metals iron, lead and zinc can each be manufactured by the reduction of the oxides with coke.

What is the correct order of the ease of reduction of the metal oxides?

	oxides becoming more difficult to reduce →
A	iron, lead, zinc
B	iron, zinc, lead
C	lead, iron, zinc
D	zinc, iron, lead

- 29 The diagram shows the structure of brass.



Why is brass harder than pure copper?

- A** The zinc atoms form strong covalent bonds with copper atoms.
- B** The zinc atoms prevent layers of copper atoms from slipping over each other easily.
- C** The zinc atoms prevent the 'sea of electrons' from moving freely in the lattice.
- D** Zinc atoms have more electrons than copper atoms.

30 Which of the following methods would **not** produce ammonia?

- A heating concentrated aqueous ammonia
- B heating ammonium chloride with calcium hydroxide
- C heating ammonium sulphate with sodium hydroxide
- D heating ammonium sulphate with dilute hydrochloric acid

31 Aqueous copper(II) sulphate is electrolysed using carbon electrodes.

What happens to the electrolyte?

- A It becomes more acidic.
- B It becomes more alkaline.
- C It turns deeper blue.
- D It remains unchanged.

32 The water in a lake showed signs of eutrophication.

What could be the cause of this?

- A increasing the amount of dissolved fertiliser
- B increasing the amount of dissolved oxygen
- C decreasing the amount of dissolved mineral salts
- D decreasing the number of bacteria

33 Methane, sulphur dioxide and carbon dioxide are gases which affect the atmosphere and the environment.

In what way do these gases affect the environment?

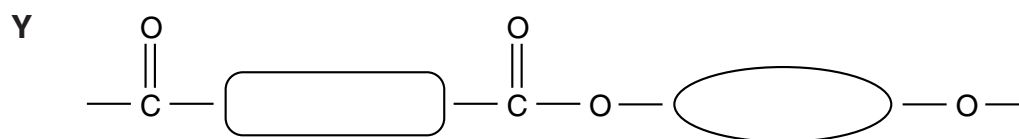
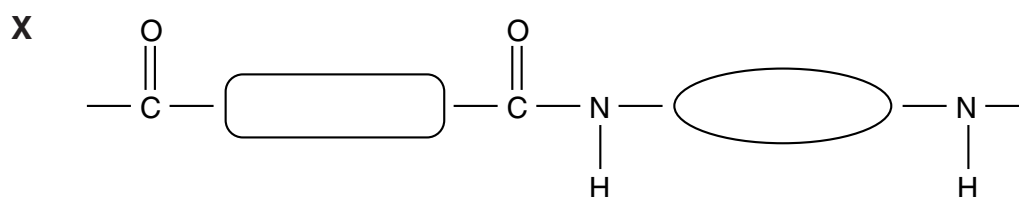
	methane	sulphur dioxide	carbon dioxide
A	depletion of the ozone layer	acid rain	global warming
B	global warming	photochemical smog	acid rain
C	photochemical smog	global warming	depletion of the ozone layer
D	global warming	acid rain	global warming

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

What is the process called?

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

- 35 The repeating units of two polymers, **X** and **Y**, are shown below.



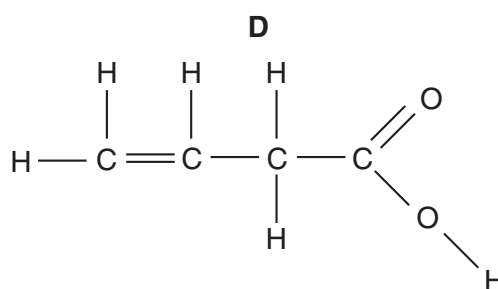
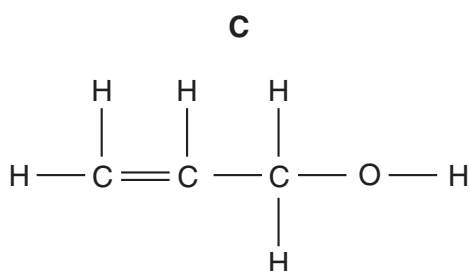
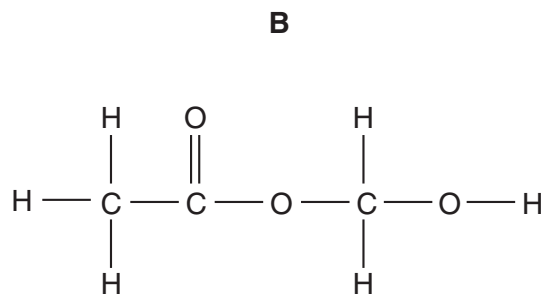
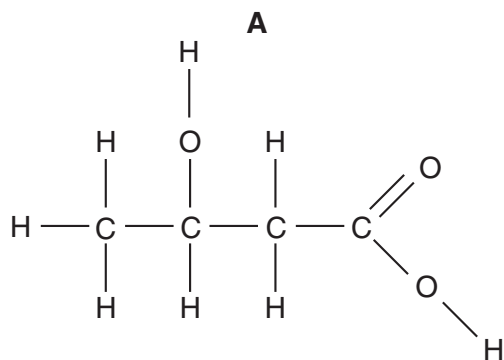
What are **X** and **Y**?

	X	Y
A	nylon	<i>Terylene</i>
B	starch	<i>Terylene</i>
C	protein	starch
D	nylon	protein

36 The table shows the results of tests carried out on compound X.

test	result
bromine water added	decolourised
sodium carbonate added	colourless gas evolved

Which formula represents compound X?



37 Butane and methylpropane are isomers.

Which formula is different for the two isomers?

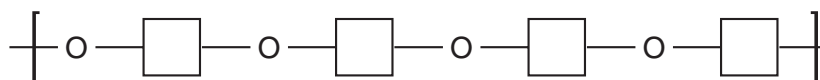
- A empirical formula
- B general formula
- C molecular formula
- D structural formula

38 What is the general formula of the homologous series of carboxylic acids?

methanoic acid	HCO_2H
ethanoic acid	$\text{CH}_3\text{CO}_2\text{H}$
propanoic acid	$\text{C}_2\text{H}_5\text{CO}_2\text{H}$
butanoic acid	$\text{C}_3\text{H}_7\text{CO}_2\text{H}$

- A CHO
- B $\text{C}_n\text{H}_{2n}\text{O}$
- C $\text{C}_n\text{H}_n\text{O}_n$
- D $\text{C}_n\text{H}_{2n}\text{O}_2$

39 A section of a polymer is shown.



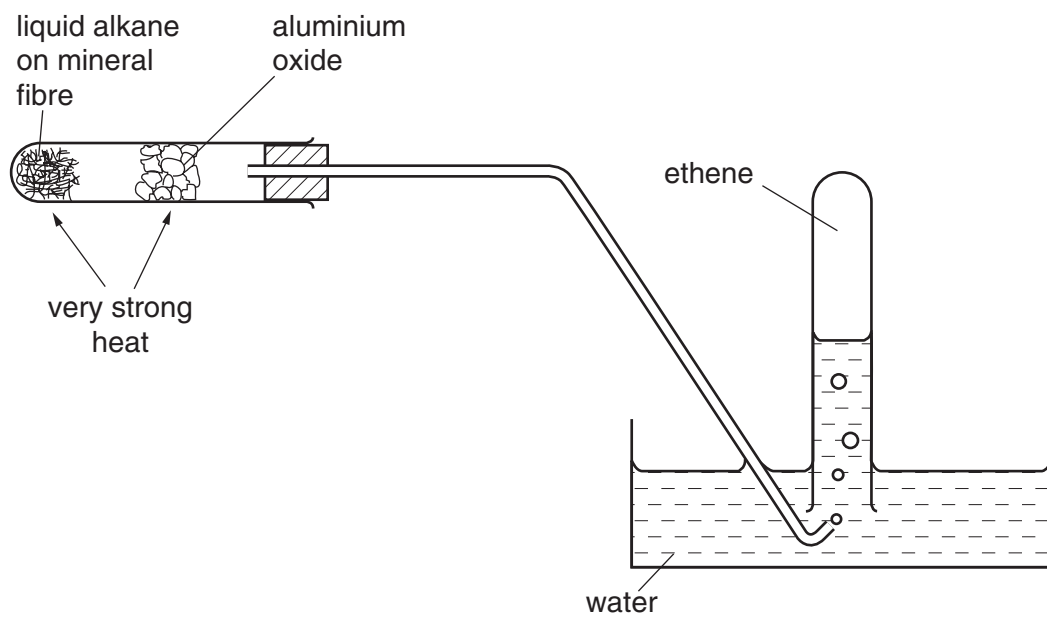
The monomer is



The monomer undergoes condensation polymerisation. What is made each time a monomer adds to the polymer?

- A hydrogen molecules, H_2
- B hydroxide ions, OH^-
- C oxygen atoms, O
- D water molecules, H_2O

40 The experiment shown is carried out.



What process occurs?

- A cracking
- B dehydrogenation
- C distillation
- D polymerisation

BLANK PAGE

DATA SHEET
The Periodic Table of the Elements

		Group										
I	II	III	IV	V	VI	VII	O					
7 Li Lithium 3	9 Be Beryllium 4	1 H Hydrogen 1	11 B Boron 5	12 C Carbon 6	13 Al Aluminium 13	14 Si Silicon 14	15 P Phosphorus 15	16 S Sulphur 16	17 Cl Chlorine 17	18 Ar Argon 18	19 F Fluorine 9	20 Ne Neon 10
23 Na Sodium 11	24 Mg Magnesium 12	27 Fe Iron 26	28 Ni Nickel 28	29 Cu Copper 29	30 Zn Zinc 30	31 Ga Gallium 31	32 Ge Germanium 32	33 As Arsenic 33	34 Se Selenium 34	35 Br Bromine 35	53 I Iodine 53	54 Xe Xenon 54
39 K Potassium 19	40 Ca Calcium 20	41 Rb Rubidium 37	42 Mo Molybdenum 42	43 Tc Technetium 43	44 Ru Ruthenium 44	45 Rh Rhodium 45	46 Pd Palladium 46	47 Ag Silver 47	48 Cd Cadmium 48	49 In Indium 49	50 Sn Tin 50	51 Sb Antimony 51
55 Cs Caesium 55	56 Ba Barium 56	57 Fr Francium 87	58 Ce Cerium 58	59 Pr Praseodymium 59	60 Nd Neodymium 60	61 Pm Promethium 61	62 Sm Samarium 62	63 Eu Europium 63	64 Gd Gadolinium 64	65 Tb Terbium 65	66 Dy Dysprosium 66	67 Ho Holmium 67
			68 Er Erbium 68	69 Tm Thulium 69	70 Yb Ytterbium 70	71 Lu Lutetium 71	72 Th Thorium 90	73 Pa Protactinium 91	74 U Uranium 92	75 Np Neptunium 93	76 Pu Plutonium 94	77 Am Americium 95
			78 Os Osmium 76	79 Ir Iridium 77	80 Pt Platinum 78	81 Au Gold 79	82 Hg Mercury 80	83 Tl Thallium 81	84 Pb Lead 82	85 Bi Bismuth 83	86 Po Polonium 84	87 At Astatine 85
			88 Sr Strontium 38	89 Y Yttrium 39	90 Zr Zirconium 40	91 Nb Niobium 41	92 Mo Molybdenum 42	93 Ta Tantalum 73	94 W Tungsten 74	95 Re Rhenium 75	96 Os Osmium 76	97 Ir Iridium 77
			98 Ra Radium 88	89 Ac Actinium 89	90 Th Thorium 90	91 Pa Protactinium 91	92 U Uranium 92	93 Np Neptunium 93	94 Pu Plutonium 94	95 Am Americium 95	96 Cm Curium 96	97 Bk Berkelium 97
			103 La Lanthanum 57	104 Ce Cerium 58	105 Pr Praseodymium 59	106 Nd Neodymium 60	107 Pm Promethium 61	108 Sm Samarium 62	109 Eu Europium 63	110 Gd Gadolinium 64	111 Tb Terbium 65	112 Dy Dysprosium 66
			113 Ba Barium 56	114 La Lanthanum 57	115 Ce Cerium 58	116 Pr Praseodymium 59	117 Nd Neodymium 60	118 Pm Promethium 61	119 Sm Samarium 62	120 Eu Europium 63	121 Gd Gadolinium 64	122 Tb Terbium 65
			127 Rn Radon 86	128 At Astatine 85	129 Po Polonium 84	130 Bi Bismuth 83	131 Pb Lead 82	132 Tl Thallium 81	133 Pb Lead 82	134 Bi Bismuth 83	135 Po Polonium 84	136 At Astatine 85
			137 Fr Francium 87	138 Ra Radium 88	139 Ac Actinium 89	140 Th Thorium 90	141 Pa Protactinium 91	142 U Uranium 92	143 Np Neptunium 93	144 Pu Plutonium 94	145 Am Americium 95	146 Cm Curium 96
			151 Lu Lutetium 71	152 Yb Ytterbium 70	153 Lu Lutetium 71	154 Er Erbium 68	155 Tm Thulium 69	156 Yb Ytterbium 70	157 Lu Lutetium 71	158 Er Erbium 68	159 Tm Thulium 69	160 Yb Ytterbium 70
			163 Ho Holmium 67	164 Er Erbium 68	165 Tm Thulium 69	166 Yb Ytterbium 70	167 Lu Lutetium 71	168 Er Erbium 68	169 Tm Thulium 69	170 Yb Ytterbium 70	171 Lu Lutetium 71	172 Er Erbium 68
			173 Ho Holmium 67	174 Er Erbium 68	175 Tm Thulium 69	176 Yb Ytterbium 70	177 Lu Lutetium 71	178 Er Erbium 68	179 Tm Thulium 69	180 Yb Ytterbium 70	181 Lu Lutetium 71	182 Er Erbium 68
			183 Ho Holmium 67	184 Er Erbium 68	185 Tm Thulium 69	186 Yb Ytterbium 70	187 Lu Lutetium 71	188 Er Erbium 68	189 Tm Thulium 69	190 Yb Ytterbium 70	191 Lu Lutetium 71	192 Er Erbium 68
			193 Ho Holmium 67	194 Er Erbium 68	195 Tm Thulium 69	196 Yb Ytterbium 70	197 Lu Lutetium 71	198 Er Erbium 68	199 Tm Thulium 69	200 Yb Ytterbium 70	201 Lu Lutetium 71	202 Er Erbium 68
			203 Ho Holmium 67	204 Er Erbium 68	205 Tm Thulium 69	206 Yb Ytterbium 70	207 Lu Lutetium 71	208 Er Erbium 68	209 Tm Thulium 69	210 Yb Ytterbium 70	211 Lu Lutetium 71	212 Er Erbium 68
			213 Ho Holmium 67	214 Er Erbium 68	215 Tm Thulium 69	216 Yb Ytterbium 70	217 Lu Lutetium 71	218 Er Erbium 68	219 Tm Thulium 69	220 Yb Ytterbium 70	221 Lu Lutetium 71	222 Er Erbium 68
			223 Ho Holmium 67	224 Er Erbium 68	225 Tm Thulium 69	226 Yb Ytterbium 70	227 Lu Lutetium 71	228 Er Erbium 68	229 Tm Thulium 69	230 Yb Ytterbium 70	231 Lu Lutetium 71	232 Er Erbium 68
			233 Ho Holmium 67	234 Er Erbium 68	235 Tm Thulium 69	236 Yb Ytterbium 70	237 Lu Lutetium 71	238 Er Erbium 68	239 Tm Thulium 69	240 Yb Ytterbium 70	241 Lu Lutetium 71	242 Er Erbium 68
			243 Ho Holmium 67	244 Er Erbium 68	245 Tm Thulium 69	246 Yb Ytterbium 70	247 Lu Lutetium 71	248 Er Erbium 68	249 Tm Thulium 69	250 Yb Ytterbium 70	251 Lu Lutetium 71	252 Er Erbium 68
			253 Ho Holmium 67	254 Er Erbium 68	255 Tm Thulium 69	256 Yb Ytterbium 70	257 Lu Lutetium 71	258 Er Erbium 68	259 Tm Thulium 69	260 Yb Ytterbium 70	261 Lu Lutetium 71	262 Er Erbium 68
			263 Ho Holmium 67	264 Er Erbium 68	265 Tm Thulium 69	266 Yb Ytterbium 70	267 Lu Lutetium 71	268 Er Erbium 68	269 Tm Thulium 69	270 Yb Ytterbium 70	271 Lu Lutetium 71	272 Er Erbium 68
			273 Ho Holmium 67	274 Er Erbium 68	275 Tm Thulium 69	276 Yb Ytterbium 70	277 Lu Lutetium 71	278 Er Erbium 68	279 Tm Thulium 69	280 Yb Ytterbium 70	281 Lu Lutetium 71	282 Er Erbium 68
			283 Ho Holmium 67	284 Er Erbium 68	285 Tm Thulium 69	286 Yb Ytterbium 70	287 Lu Lutetium 71	288 Er Erbium 68	289 Tm Thulium 69	290 Yb Ytterbium 70	291 Lu Lutetium 71	292 Er Erbium 68
			293 Ho Holmium 67	294 Er Erbium 68	295 Tm Thulium 69	296 Yb Ytterbium 70	297 Lu Lutetium 71	298 Er Erbium 68	299 Tm Thulium 69	300 Yb Ytterbium 70	301 Lu Lutetium 71	302 Er Erbium 68
			303 Ho Holmium 67	304 Er Erbium 68	305 Tm Thulium 69	306 Yb Ytterbium 70	307 Lu Lutetium 71	308 Er Erbium 68	309 Tm Thulium 69	310 Yb Ytterbium 70	311 Lu Lutetium 71	312 Er Erbium 68
			313 Ho Holmium 67	314 Er Erbium 68	315 Tm Thulium 69	316 Yb Ytterbium 70	317 Lu Lutetium 71	318 Er Erbium 68	319 Tm Thulium 69	320 Yb Ytterbium 70	321 Lu Lutetium 71	322 Er Erbium 68
			323 Ho Holmium 67	324 Er Erbium 68	325 Tm Thulium 69	326 Yb Ytterbium 70	327 Lu Lutetium 71	328 Er Erbium 68	329 Tm Thulium 69	330 Yb Ytterbium 70	331 Lu Lutetium 71	332 Er Erbium 68
			333 Ho Holmium 67	334 Er Erbium 68	335 Tm Thulium 69	336 Yb Ytterbium 70	337 Lu Lutetium 71	338 Er Erbium 68	339 Tm Thulium 69	340 Yb Ytterbium 70	341 Lu Lutetium 71	342 Er Erbium 68
			343 Ho Holmium 67	344 Er Erbium 68	345 Tm Thulium 69	346 Yb Ytterbium 70	347 Lu Lutetium 71	348 Er Erbium 68	349 Tm Thulium 69	350 Yb Ytterbium 70	351 Lu Lutetium 71	352 Er Erbium 68
			353 Ho Holmium 67	354 Er Erbium 68	355 Tm Thulium 69	356 Yb Ytterbium 70	357 Lu Lutetium 71	358 Er Erbium 68	359 Tm Thulium 69	360 Yb Ytterbium 70	361 Lu Lutetium 71	362 Er Erbium 68
			363 Ho Holmium 67	364 Er Erbium 68	365 Tm Thulium 69	366 Yb Ytterbium 70	367 Lu Lutetium 71	368 Er Erbium 68	369 Tm Thulium 69	370 Yb Ytterbium 70	371 Lu Lutetium 71	372 Er Erbium 68
			373 Ho Holmium 67	374 Er Erbium 68	375 Tm Thulium 69	376 Yb Ytterbium 70	377 Lu Lutetium 71	378 Er Erbium 68	379 Tm Thulium 69	380 Yb Ytterbium 70	381 Lu Lutetium 71	382 Er Erbium 68
			383 Ho Holmium 67	384 Er Erbium 68	385 Tm Thulium 69	386 Yb Ytterbium 70	387 Lu Lutetium 71	388 Er Erbium 68	389 Tm Thulium 69	390 Yb Ytterbium 70	391 Lu Lutetium 71	392 Er Erbium 68
			393 Ho Holmium 67	394 Er Erbium 68	395 Tm Thulium 69	396 Yb Ytterbium 70	397 Lu Lutetium 71	398 Er Erbium 68	399 Tm Thulium 69	400 Yb Ytterbium 70	401 Lu Lutetium 71	402 Er Erbium 68
			403 Ho Holmium 67	404 Er Erbium 68	405 Tm Thulium 69	406 Yb Ytterbium 70	407 Lu Lutetium 71	408 Er Erbium 68	409 Tm Thulium 69	410 Yb Ytterbium 70	411 Lu Lutetium 71	412 Er Erbium 68
			413 Ho Holmium 67	414 Er Erbium 68	415 Tm Thulium 69	416 Yb Ytterbium 70	417 Lu Lutetium 71	418 Er Erbium 68	419 Tm Thulium 69	420 Yb Ytterbium 70	421 Lu Lutetium 71	422 Er Erbium 68
			423 Ho Holmium 67	424 Er Erbium 68	425 Tm Thulium 69	426 Yb Ytterbium 70	427 Lu Lutetium 71	428 Er Erbium 68	429 Tm Thulium 69	430 Yb Ytterbium 70	431 Lu Lutetium 71	432 Er Erbium 68
			433 Ho Holmium 67	434 Er Erbium 68	435 Tm Thulium 69	436 Yb Ytterbium 70	437 Lu Lutetium 71	438 Er Erbium 68	439 Tm Thulium 69	440 Yb Ytterbium 70	441 Lu Lutetium 71	442 Er Erbium 68
			443 Ho Holmium 67	444 Er Erbium 68	445 Tm Thulium 69	446 Yb Ytterbium 70	447 Lu Lutetium 71	448 Er Erbium 68	449 Tm Thulium 69	450 Yb Ytterbium 70	451 Lu Lutetium 71	452 Er Erbium 68
			453 Ho Holmium 67</									