

UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE
Joint Examination for the School Certification
and General Certificate of Education Ordinary Level

CHEMISTRY

5070/1

PAPER 1 Multiple Choice

OCTOBER/NOVEMBER SESSION 2002

1 hour

Additional materials:

Multiple Choice answer sheet

Soft clean eraser

Soft pencil (type B or HB is recommended)

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your name, Centre number and candidate number on the answer sheet in the spaces provided unless this has already been done for you.

There are **forty** questions in 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 very carefully the instructions on the answer sheet.

INFORMATION FOR CANDIDATES

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.

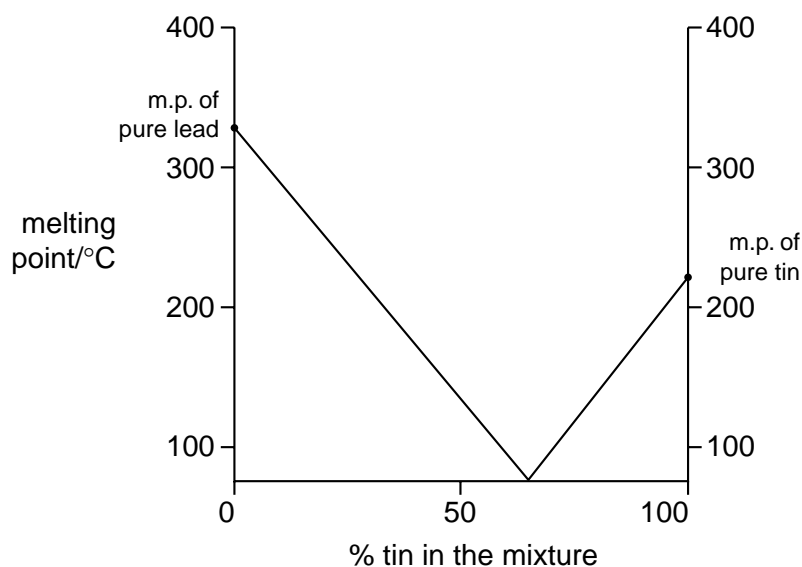
A copy of the Periodic Table is printed on page 16.

This question paper consists of 15 printed pages and 1 blank page.

1 Which property of a gas affects the rate at which it spreads throughout a laboratory?

- A boiling point
- B molecular mass
- C reactivity
- D solubility in water

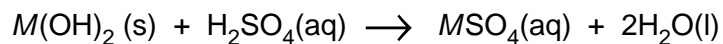
2 The graph gives the melting points of mixtures of lead and tin.



The graph shows that any mixture of lead and tin must have a melting point

- A above that of tin.
 - B below that of lead.
 - C below that of both tin and lead.
 - D between that of tin and lead.
- 3 From which mixture can the underlined substance be obtained by adding water, stirring and filtering?
- A calcium carbonate and sodium chloride
 - B copper(II) sulphate and sodium chloride
 - C ethanoic acid and ethanol
 - D iron and magnesium

- 4 An aqueous solution of a sulphate is made from a solid hydroxide, of a metal **M**, by the reaction:



For which hydroxide would the method **not** work?

- A barium hydroxide
 - B copper(II) hydroxide
 - C iron(II) hydroxide
 - D magnesium hydroxide
- 5 Which ion has the most shells that contain electrons?
- A Al^{3+}
 - B Be^{2+}
 - C N^{3-}
 - D S^{2-}
- 6 The table gives data about four substances.

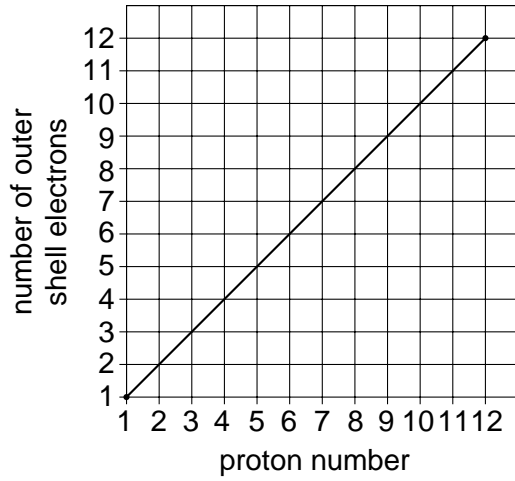
Which substance could be an ionic compound?

compound	melting point / °C	electrical conductivity in aqueous solution
A	-73	good
B	32	poor
C	474	poor
D	805	good

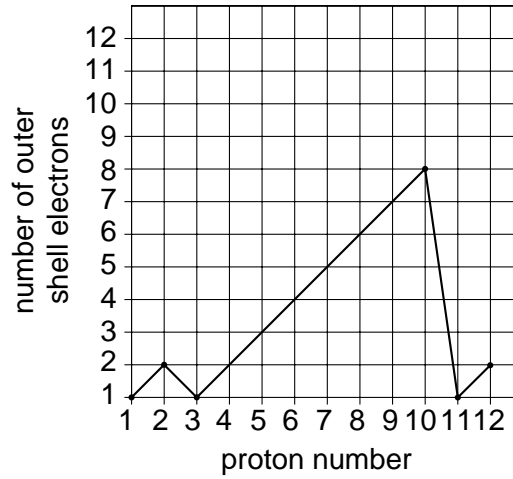
- 7 The number of outer shell electrons for the atoms of the first 12 elements in the Periodic Table is plotted against the proton number of the element.

Which graph is obtained?

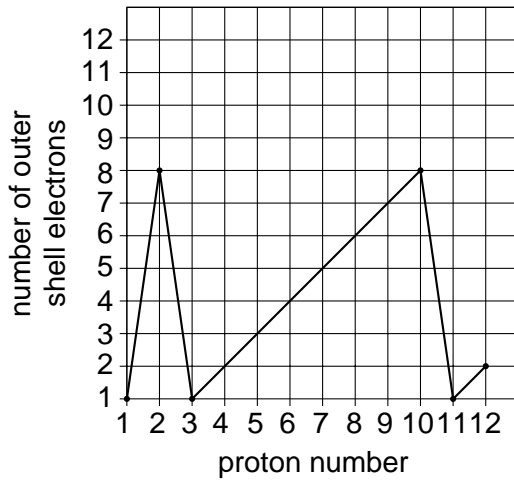
A



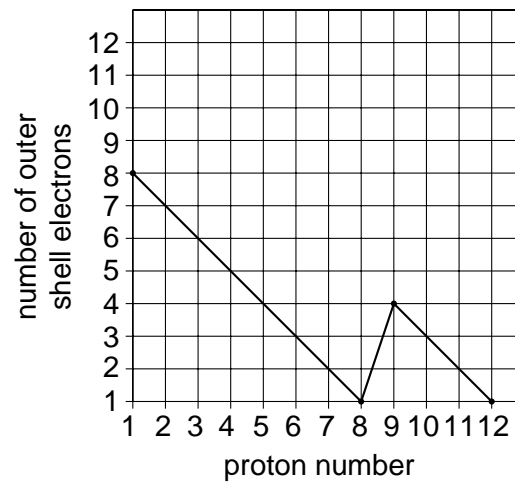
B



C



D



8 The table shows the electron structures of four elements.

element	electronic structure
W	2, 6
X	2, 8
Y	2, 8, 1
Z	2, 8, 7

Which pair of atoms will form a covalent substance?

- A** two atoms of **W**
B two atoms of **X**
C an atom of **W** and an atom of **X**
D an atom of **Y** and an atom of **Z**
- 9 Which substance contains covalent bonds, but also conducts electricity?
- A** brass
B graphite
C iodine
D steel
- 10 One mole of each of the following compounds is burnt in excess oxygen.

Which compound will produce three moles of carbon dioxide and three moles of steam only?

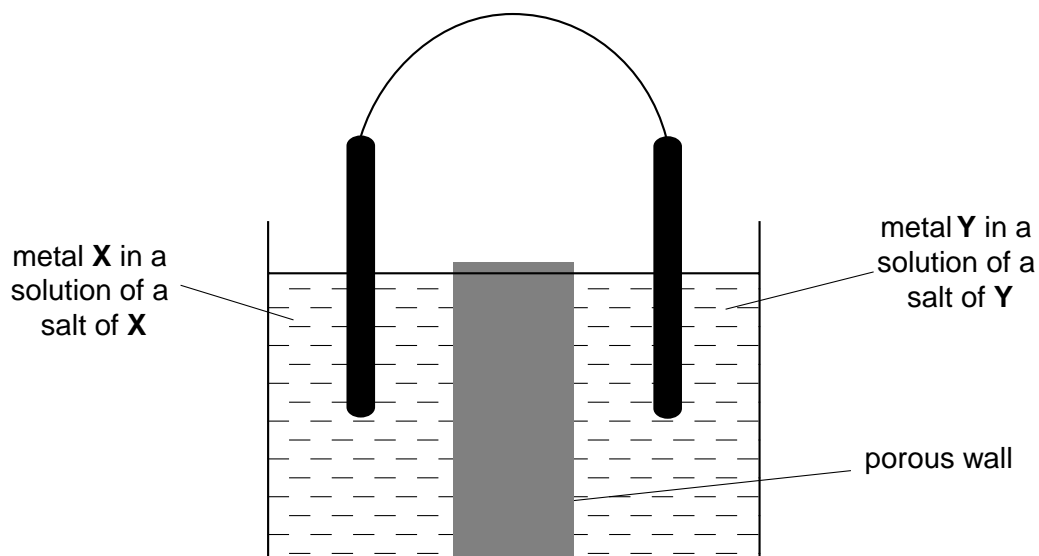
- A** C_3H_8 **B** C_3H_7OH **C** $C_3H_7CO_2H$ **D** $CH_3CO_2CH_3$

11 When zinc reacts with dilute sulphuric acid a gas is released.

What happens to the zinc and what is the gas released?

	the zinc is	the gas is
A	oxidised	hydrogen
B	oxidised	sulphur dioxide
C	reduced	hydrogen
D	reduced	sulphur dioxide

- 12 Which pair of metals **X** and **Y** will produce the highest voltage when used as electrodes in a simple cell?



	metal X	metal Y
A	copper	silver
B	magnesium	silver
C	magnesium	zinc
D	zinc	copper

- 13 Four electrolytes were electrolysed using carbon electrodes.

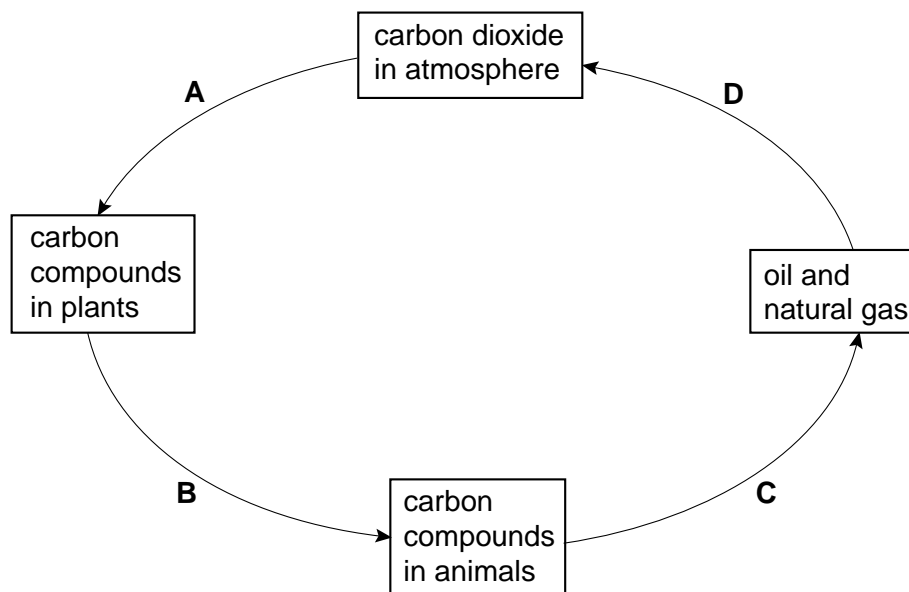
Which set of data is correct?

	electrolyte	product at	
		anode	cathode
A	CuSO_4 (aq)	oxygen	copper
B	NaCl (aq)	chlorine	sodium
C	NaH (l)	sodium	hydrogen
D	PbBr_2 (l)	lead	bromine

14 Which pair of substances are isotopes?

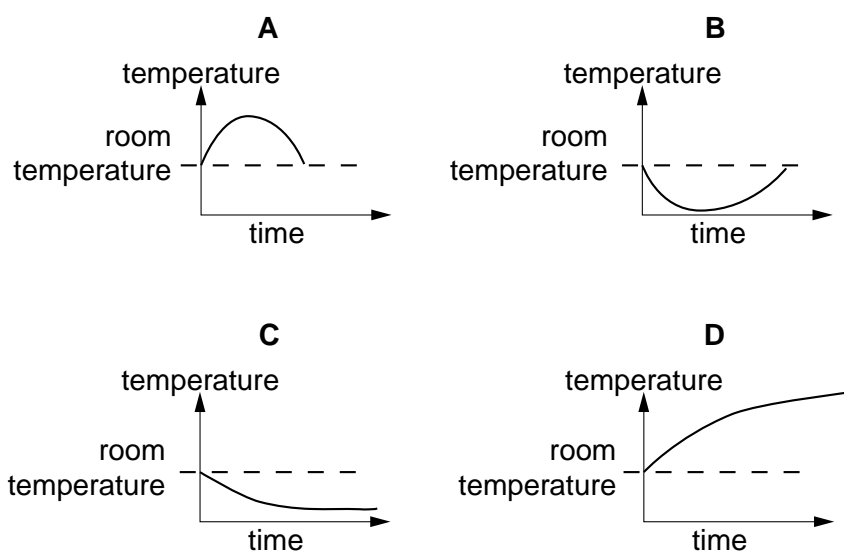
- A $^{12}_6\text{C}$ and $^{14}_6\text{C}$
- B carbon dioxide and carbon monoxide
- C diamond and graphite
- D C_2H_4 and C_3H_6

15 Which step in the diagram shows the process of photosynthesis?



16 Dissolving ammonium nitrate in water is endothermic.

Which graph shows how the temperature alters as the ammonium nitrate is added to water and then the solution is left to stand?

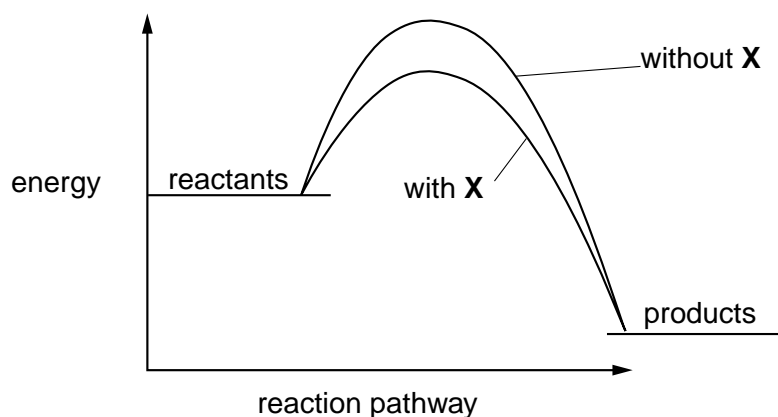


17 If a strip of magnesium is dropped into excess hydrochloric acid an exothermic reaction occurs.

The rate of this reaction increases during the first few seconds because

- A the amount of magnesium is decreasing.
- B the magnesium is acting as a catalyst.
- C the solution is becoming hotter.
- D the surface area of the magnesium is increasing.

18 The energy profile diagrams show how adding a substance **X** to a reaction mixture changes the reaction pathway.



Which change is likely to be observed when **X** is added to the reaction mixture?

- A The reaction becomes less exothermic.
 - B The reaction becomes more exothermic.
 - C The speed of the reaction decreases.
 - D The speed of the reaction increases.
- 19 Which process does **not** involve either oxidation or reduction?
- A formation of ammonium sulphate from ammonia and sulphuric acid
 - B formation of nitrogen monoxide from ammonia
 - C formation of sulphuric acid from sulphur
 - D formation of zinc from zinc blende (ZnS)

- 20 In separate experiments, an excess of aqueous sodium hydroxide or aqueous ammonia was gradually added to a solution **X**.

In both experiments, a precipitate was obtained which dissolved in an excess of the added reagent.

What could **X** contain?

- A copper(II) nitrate
 - B iron(II) nitrate
 - C iron(III) nitrate
 - D zinc nitrate
- 21 An excess of dilute sulphuric acid reacts with both aqueous barium hydroxide and aqueous barium chloride. In what way are the two reactions the same?
- A A gas is produced.
 - B An insoluble salt is produced.
 - C The final pH is 7.
 - D Water is produced.
- 22 Which property decides the order of the elements in the Periodic Table?
- A the masses of their atoms
 - B the number of electrons in the outer shell
 - C the number of neutrons in the nucleus
 - D the number of protons in the nucleus

- 23 The proton number of indium, In, is 49.

What is the most likely formula for the oxide of indium?

- A In_2O
 - B In_2O_3
 - C InO
 - D InO_2
- 24 Which element in the table is likely to be a transition metal?

<i>element</i>	<i>melting point</i>	<i>colour of chloride</i>
A	high	blue
B	low	green
C	high	white
D	low	white

25 Which feature of a metal's structure is responsible for it conducting electricity?

- A It contains positive ions.
- B It has a "sea of electrons".
- C Its ions are tightly packed together.
- D Its positive ions attract electrons.

26 Aluminium is extracted from purified bauxite by electrolysis but iron is extracted from haematite by reduction with coke.

Why is iron not extracted by electrolysis?

- A Haematite needs to be purified but bauxite does not.
- B Iron is less reactive than aluminium.
- C Reduction with coke is cheaper than electrolysis.
- D Reduction with coke gives a purer product than electrolysis.

27 Old steel drums corrode quickly in a damp atmosphere but aluminium cans do not.

Which of the following correct statements explains this behaviour of aluminium?

- A Aluminium has only one valency.
- B Aluminium has a lower density than iron.
- C Aluminium is above iron in the activity series.
- D Aluminium is protected by its oxide layer.

28 Caesium is a metal that is more reactive than aluminium.

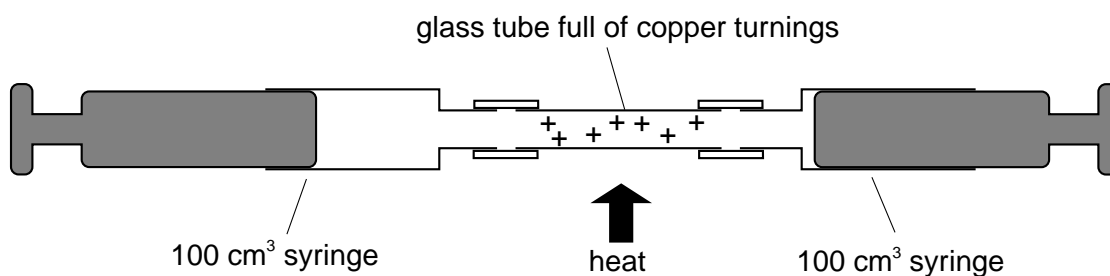
Which reaction would produce caesium?

- A electrolysing aqueous caesium chloride
- B electrolysing molten caesium chloride
- C heating caesium carbonate
- D heating caesium oxide with carbon

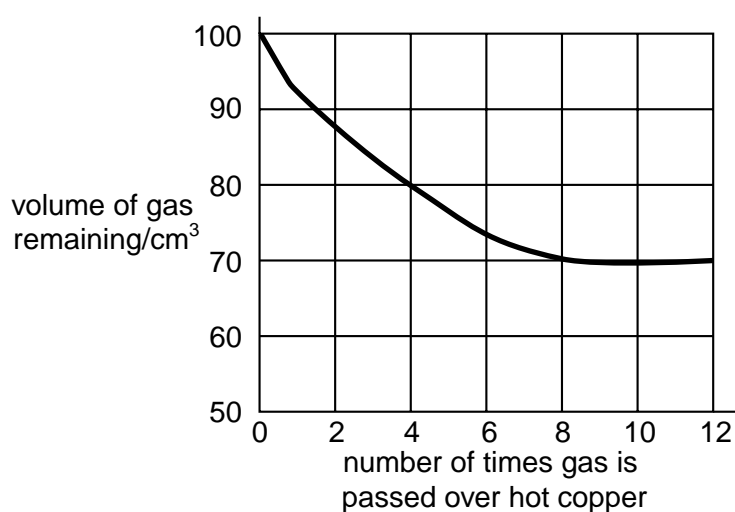
29 Which of the following gases **cannot** be removed from the exhaust gases of a petrol powered car by its catalytic converter?

- A carbon dioxide
- B carbon monoxide
- C hydrocarbons
- D nitrogen dioxide

- 30 A 100 cm³ sample of bottled gas used for diving was placed in a gas syringe in the apparatus shown.

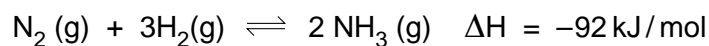


The gas was passed backward and forward over heated copper turnings. The results obtained were used to plot the graph.



What is the percentage of oxygen in the bottled gas?

- A 20% B 30% C 70% D 80%
- 31 In the Haber process, nitrogen and hydrogen react to form ammonia.



Which factor increases **both** the speed of reaction and the amount of ammonia produced?

- A addition of a catalyst
 B decreasing the temperature
 C increasing the pressure
 D increasing the temperature

32 Nitrates from fertilisers used on farmland can cause pollution.

Why do nitrates pollute rivers?

- A Nitrates are salts.
- B Nitrates are very soluble in water.
- C Nitrates contain oxygen.
- D Nitrate ions are negatively charged.

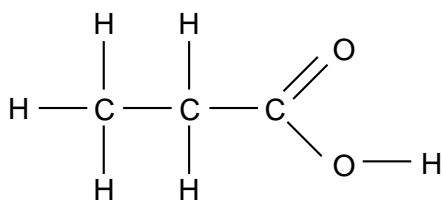
33 Which representation of dilute sulphuric acid is correct?

- A $\text{H}_2(\text{aq}) + \text{SO}_4^{2-}(\text{aq})$
- B $2\text{H}^+(\text{aq}) + \text{SO}_4^{2-}(\text{aq})$
- C $2\text{H}^+(\text{aq}) + \text{SO}_4^-(\text{aq})$
- D $\text{H}_2\text{SO}_4(\text{l})$

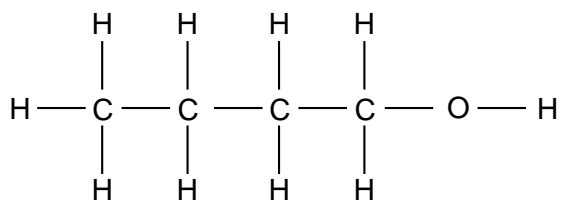
34 Which statement describes what happens when hydrogen and oxygen are used in a fuel cell?

- A Electricity is generated directly.
- B Electricity is used to produce water.
- C Hydrogen is burned to form steam.
- D Hydrogen reacts to form a hydrocarbon fuel.

35 The structures of an acid and an alcohol are shown.



acid



alcohol

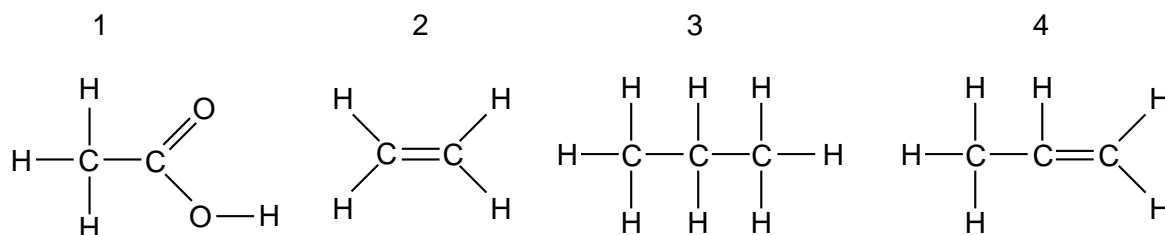
Which pairing of names correctly identify the two compounds?

	acid	alcohol
A	ethanoic	butanol
B	ethanoic	propanol
C	propanoic	propanol
D	propanoic	butanol

36 Which physical property of the alkanes does **not** increase as relative molecular mass increases?

- A boiling point
- B flammability
- C melting point
- D viscosity

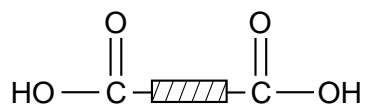
37 The structures of four organic compounds are shown.



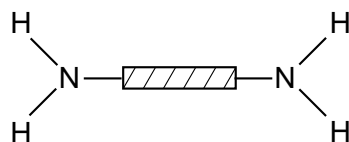
Which compounds decolourise bromine water?

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

38 A polymer X was hydrolysed and the two products were



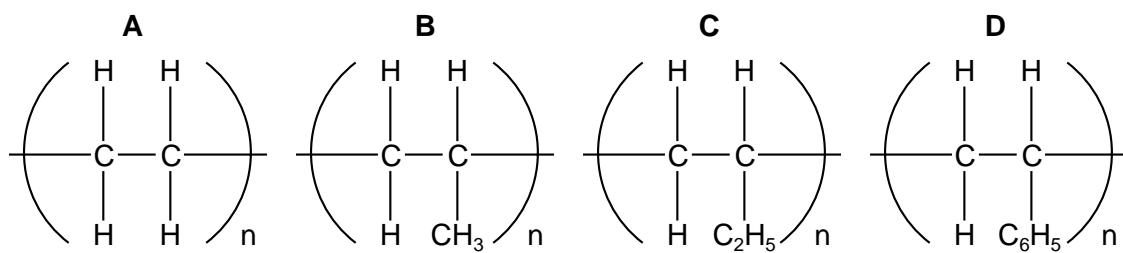
and



What can be deduced about X?

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

39 Which polymer has the empirical formula CH?



40 In the polymerisation of ethene to form poly(ethene), there is no change in

- A boiling point.
- B density.
- C mass.
- D molecular formula.

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	<table border="1" style="margin: auto;"> <tr> <td>1 H Hydrogen 1</td> </tr> </table>										1 H Hydrogen 1	11 B Boron 5	12 C Carbon 6	14 Si Silicon 14	15 P Phosphorus 15	16 S Sulphur 16	17 Cl Chlorine 17	18 Ar Argon 18	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	36 Kr Krypton 36	37 Rb Rubidium 37	38 Sr Strontium 38	39 Y Yttrium 39	40 Ca Calcium 20	41 Nb Niobium 41	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	52 Te Tellurium 52	53 I Iodine 53	54 Xe Xenon 54	55 Cs Caesium 55	56 Ba Barium 56	57 La Lanthanum 57	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 Fr Francium 87	88 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	98 Cf Californium 98	99 Es Einsteinium 99	100 Fm Fermium 100	101 Md Mendelevium 101	102 No Nobelium 102	103 Lr Lawrencium 103	133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57	140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	146 Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71	226 Ra Radium 88	227 Ac Actinium 89	232 Th Thorium 90	238 U Uranium 92	238 Pa Protactinium 91	238 Np Neptunium 93	238 Pu Plutonium 94	238 Am Americium 95	238 Cm Curium 96	238 Bk Berkelium 97	238 Cf Californium 98	238 Es Einsteinium 99	238 Fm Fermium 100	238 Md Mendelevium 101	238 No Nobelium 102	238 Lr Lawrencium 103
1 H Hydrogen 1																																																																																																																					
19 K Potassium 19	20 Ca Calcium 20	21 Sc Scandium 21	22 Ti Titanium 22	23 V Vanadium 23	24 Cr Chromium 24	25 Mn Manganese 25	26 Fe Iron 26	27 Co Cobalt 27	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	36 Kr Krypton 36	37 Rb Rubidium 37	38 Sr Strontium 38	39 Y Yttrium 39	40 Ca Calcium 20	41 Nb Niobium 41	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	52 Te Tellurium 52	53 I Iodine 53	54 Xe Xenon 54	55 Cs Caesium 55	56 Ba Barium 56	57 La Lanthanum 57	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	87 Fr Francium 87	88 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	98 Cf Californium 98	99 Es Einsteinium 99	100 Fm Fermium 100	101 Md Mendelevium 101	102 No Nobelium 102	103 Lr Lawrencium 103																																																

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

a	X
b	X

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

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