

## 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.

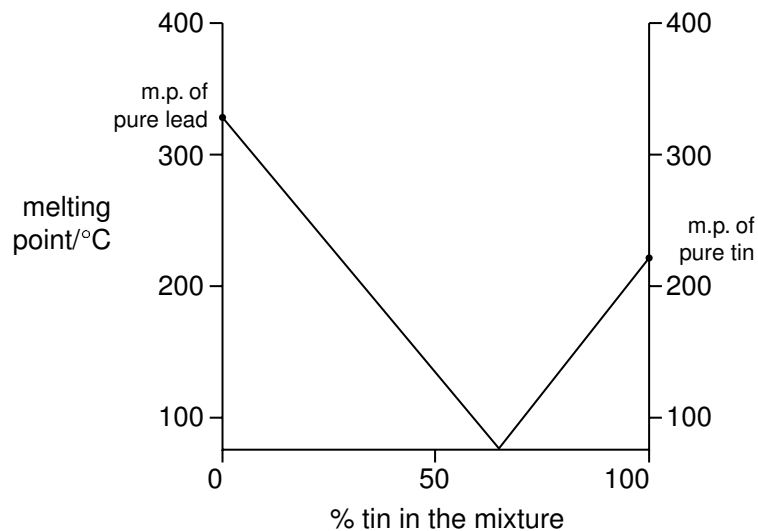
Any rough working should be done in this booklet.

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

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

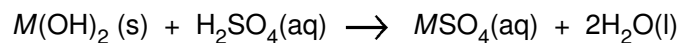
- 1 Which property of a gas affects the rate at which it spreads throughout a laboratory?
- A boiling point
  - B molecular mass
  - C reactivity
  - D solubility in water
- 2 The graph gives the melting points of mixtures of lead and tin.



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.

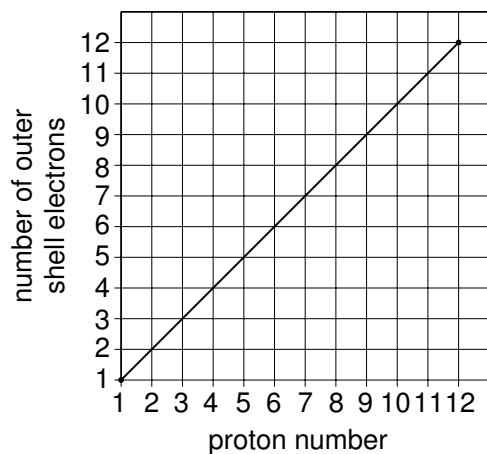
Which substance could be an ionic compound?

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

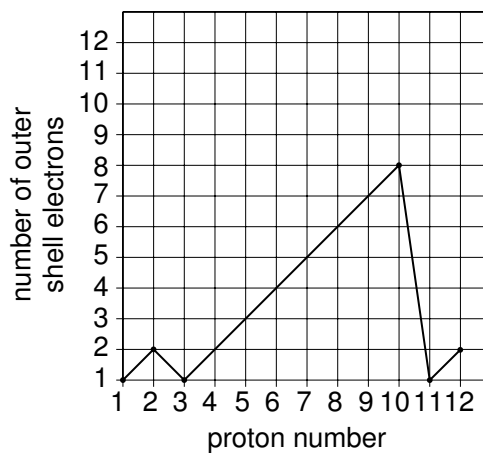
- 7 The number of outer shell electrons for the atoms of the first 12 elements in the Periodic Table is plotted against the proton number of the element.

Which graph is obtained?

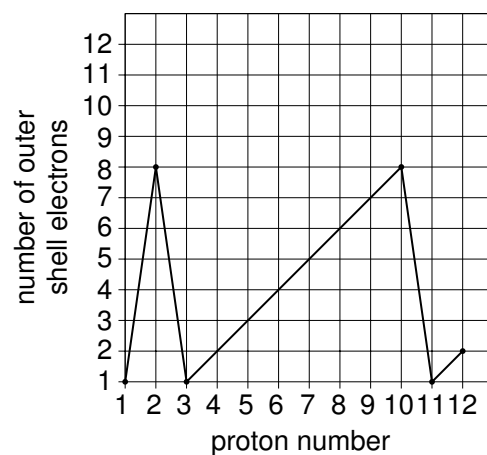
**A**



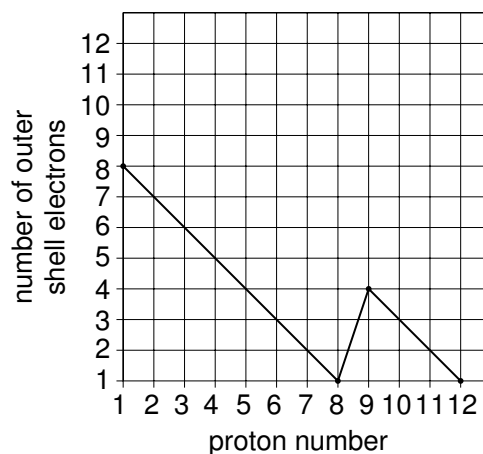
**B**



**C**



**D**



- 8 The table shows the electron structures of four elements.

element	electronic structure
<b>W</b>	2, 6
<b>X</b>	2, 8
<b>Y</b>	2, 8, 1
<b>Z</b>	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?

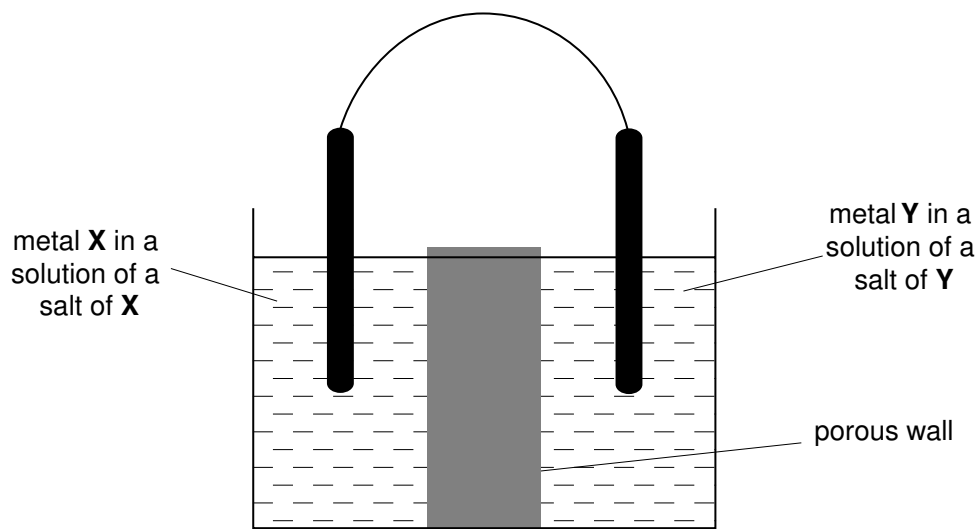
- A**  $C_3H_8$       **B**  $C_3H_7OH$       **C**  $C_3H_7CO_2H$       **D**  $CH_3CO_2CH_3$

- 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
<b>A</b>	oxidised	hydrogen
<b>B</b>	oxidised	sulphur dioxide
<b>C</b>	reduced	hydrogen
<b>D</b>	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 <b>X</b>	metal <b>Y</b>
<b>A</b>	copper	silver
<b>B</b>	magnesium	silver
<b>C</b>	magnesium	zinc
<b>D</b>	zinc	copper

- 13 Four electrolytes were electrolysed using carbon electrodes.

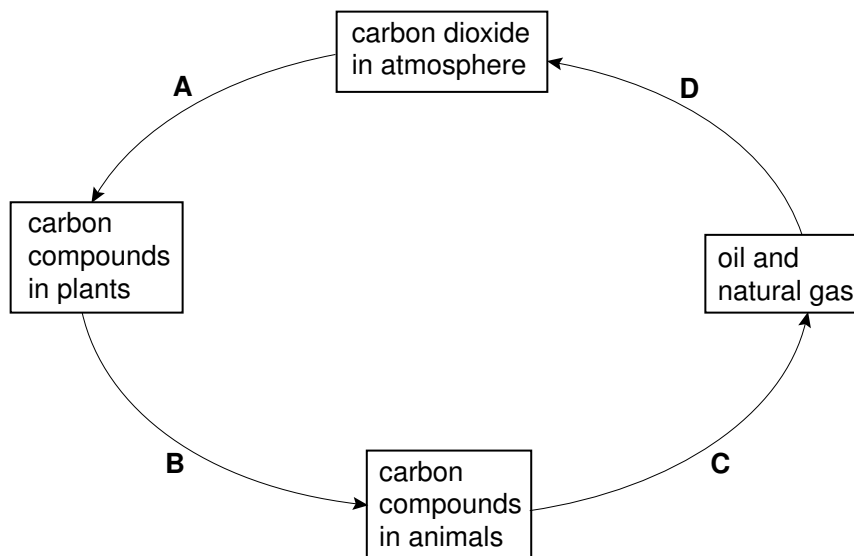
Which set of data is correct?

	electrolyte	product at	
		anode	cathode
<b>A</b>	$\text{CuSO}_4$ (aq)	oxygen	copper
<b>B</b>	$\text{NaCl}$ (aq)	chlorine	sodium
<b>C</b>	$\text{NaH}$ (l)	sodium	hydrogen
<b>D</b>	$\text{PbBr}_2$ (l)	lead	bromine

14 Which pair of substances are isotopes?

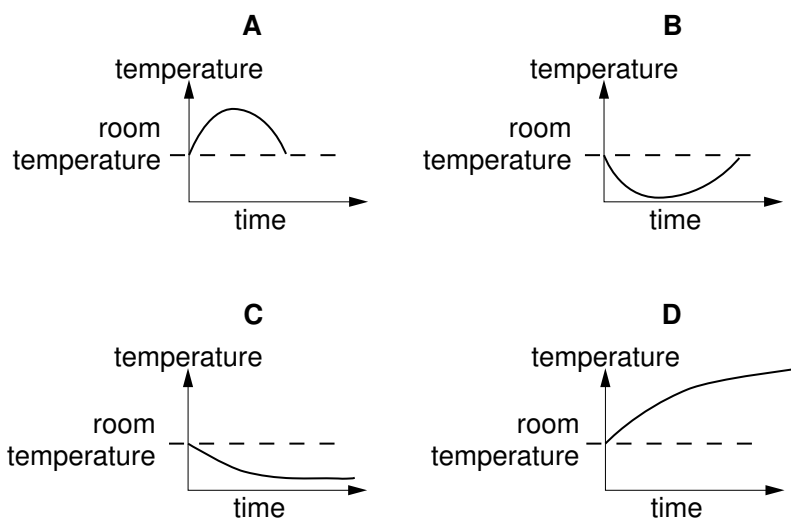
- A  $^{12}_6\text{C}$  and  $^{14}_6\text{C}$
- B carbon dioxide and carbon monoxide
- C diamond and graphite
- D  $\text{C}_2\text{H}_4$  and  $\text{C}_3\text{H}_6$

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



16 Dissolving ammonium nitrate in water is endothermic.

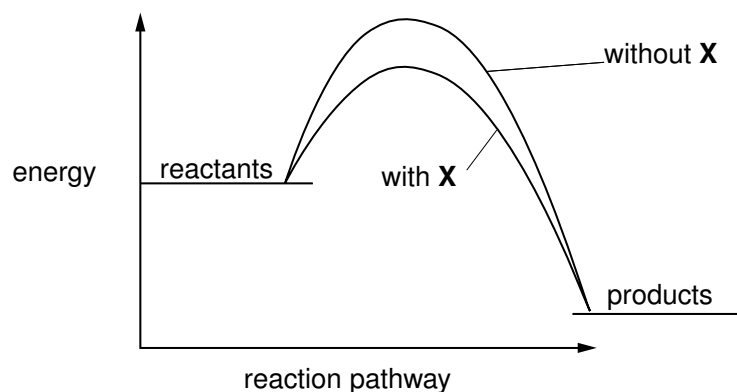
Which graph shows how the temperature alters as the ammonium nitrate is added to water and then the solution is left to stand?



- 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.

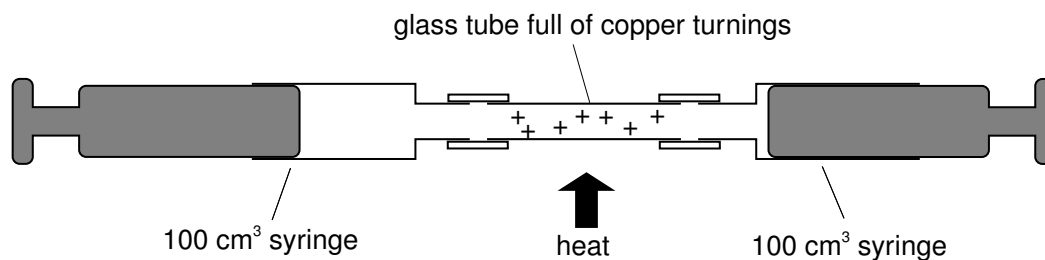
What is the most likely formula for the oxide of indium?

- A  $\text{In}_2\text{O}$
  - B  $\text{In}_2\text{O}_3$
  - C  $\text{InO}$
  - D  $\text{InO}_2$
- 24 Which element in the table is likely to be a transition metal?

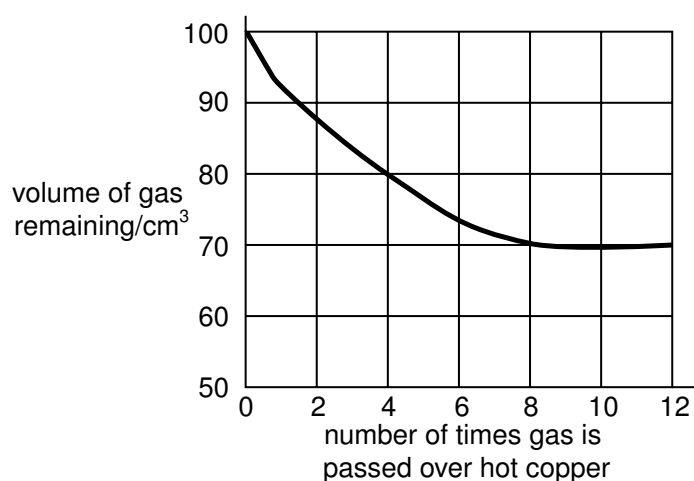
<i>element</i>	<i>melting point</i>	<i>colour of chloride</i>
A	high	blue
B	low	green
C	high	white
D	low	white

- 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 cm<sup>3</sup> 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.

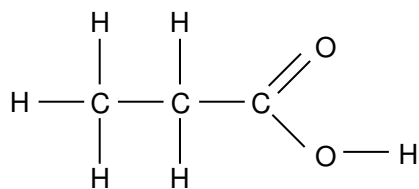
33 Which representation of dilute sulphuric acid is correct?

- 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  $\text{H}_2\text{SO}_4(\text{l})$

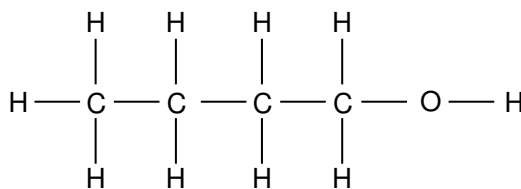
34 Which statement describes what happens when hydrogen and oxygen are used in a fuel cell?

- 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



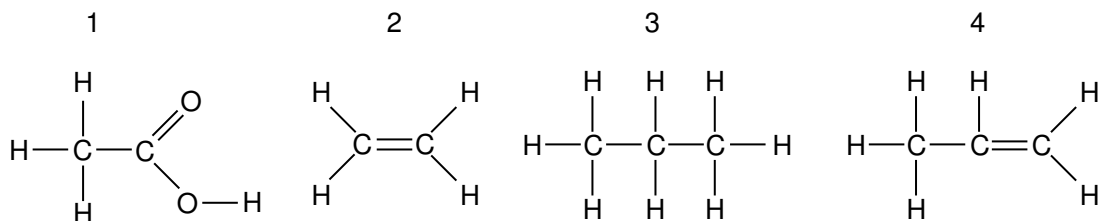
alcohol

Which pairing of names correctly identify the two compounds?

	acid	alcohol
<b>A</b>	ethanoic	butanol
<b>B</b>	ethanoic	propanol
<b>C</b>	propanoic	propanol
<b>D</b>	propanoic	butanol

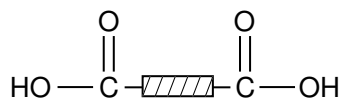
- 36 Which physical property of the alkanes does **not** increase as relative molecular mass increases?
- A boiling point  
 B flammability  
 C melting point  
 D viscosity

- 37 The structures of four organic compounds are shown.

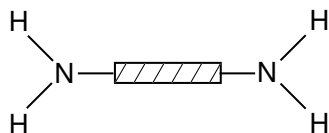


Which compounds decolourise bromine water?

- 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



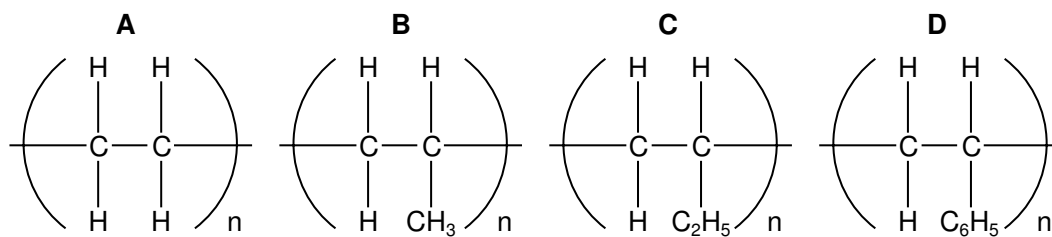
and



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 <b>Li</b> Lithium 3	9 <b>Be</b> Beryllium 4	1 <b>H</b> Hydrogen 1	11 <b>B</b> Boron 5	12 <b>C</b> Carbon 6	14 <b>N</b> Nitrogen 7	16 <b>O</b> Oxygen 8	18 <b>Ne</b> Neon 10																													
23 <b>Na</b> Sodium 11	24 <b>Mg</b> Magnesium 12	13 <b>Al</b> Aluminium 13	14 <b>Si</b> Silicon 14	15 <b>P</b> Phosphorus 15	16 <b>S</b> Sulphur 16	17 <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>Fe</b> Iron 26	28 <b>Co</b> Cobalt 27	29 <b>Ni</b> Nickel 28	30 <b>Zn</b> Zinc 30	32 <b>Ge</b> Germanium 32	36 <b>Kr</b> Krypton 36																													
85 <b>Rb</b> Rubidium 37	88 <b>Sr</b> Strontium 38	55 <b>Mn</b> Manganese 25	56 <b>Fe</b> Iron 26	59 <b>Co</b> Cobalt 27	64 <b>Cu</b> Copper 29	73 <b>Ge</b> Germanium 32	84 <b>Kr</b> Krypton 36																													
133 <b>Cs</b> Caesium 55	137 <b>Ba</b> Barium 56	101 <b>Ru</b> Ruthenium 44	103 <b>Rh</b> Rhodium 45	106 <b>Pd</b> Palladium 46	112 <b>Cd</b> Cadmium 48	119 <b>Sn</b> Tin 50	131 <b>Xe</b> Xenon 54																													
226 <b>Ra</b> Radium 88	227 <b>Ac</b> Actinium 89	75 <b>Re</b> Rhenium 75	76 <b>Os</b> Osmium 76	78 <b>Pt</b> Platinum 78	80 <b>Hg</b> Mercury 80	82 <b>Pb</b> Lead 82	86 <b>Rn</b> Radon 86																													
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 14%;">140 <b>Ce</b> Cerium 58</td> <td style="width: 14%;">141 <b>Pr</b> Praseodymium 59</td> <td style="width: 14%;">144 <b>Nd</b> Neodymium 60</td> <td style="width: 14%;">150 <b>Sm</b> Samarium 62</td> <td style="width: 14%;">152 <b>Eu</b> Europium 63</td> <td style="width: 14%;">157 <b>Gd</b> Gadolinium 64</td> <td style="width: 14%;">162 <b>Dy</b> Dysprosium 66</td> <td style="width: 14%;">165 <b>Ho</b> Holmium 67</td> <td style="width: 14%;">167 <b>Er</b> Erbium 68</td> <td style="width: 14%;">169 <b>Tm</b> Thulium 69</td> <td style="width: 14%;">173 <b>Yb</b> Ytterbium 70</td> <td style="width: 14%;">175 <b>Lu</b> Lutetium 71</td> </tr> <tr> <td>232 <b>Th</b> Thorium 90</td> <td>238 <b>U</b> Uranium 92</td> <td>91 <b>Pa</b> Protactinium 91</td> <td>94 <b>Pu</b> Plutonium 94</td> <td>95 <b>Am</b> Americium 95</td> <td>96 <b>Cm</b> Curium 96</td> <td>97 <b>Bk</b> Berkelium 97</td> <td>98 <b>Cf</b> Californium 98</td> <td>99 <b>Es</b> Einsteinium 99</td> <td>101 <b>Md</b> Mendelevium 101</td> <td>102 <b>No</b> Nobelium 102</td> <td>103 <b>Lr</b> Lawrencium 103</td> </tr> </table>													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>U</b> Uranium 92	91 <b>Pa</b> Protactinium 91	94 <b>Pu</b> Plutonium 94	95 <b>Am</b> Americium 95	96 <b>Cm</b> Curium 96	97 <b>Bk</b> Berkelium 97	98 <b>Cf</b> Californium 98	99 <b>Es</b> Einsteinium 99	101 <b>Md</b> Mendelevium 101	102 <b>No</b> Nobelium 102	103 <b>Lr</b> Lawrencium 103
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<p>*58-71 Lanthanoid series †90-103 Actinoid series</p>																																				

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

**Key**  
a  
X  
b

The volume of one mole of any gas is  $24 \text{ dm}^3$  at room temperature and pressure (r.t.p.).