



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

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**CHEMISTRY**

**5070/13**

Paper 1 Multiple Choice

**October/November 2010**

**1 hour**

Additional Materials:      Multiple Choice Answer Sheet  
   Soft clean eraser  
   Soft pencil (type B or HB recommended)

\* 6 0 1 7 4 5 3 0 1 4 \*

**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 The boiling points of various gases found in the air are shown below.

	°C
argon	-186
carbon dioxide	-78
nitrogen	-198
oxygen	-183

If the air is cooled, the first substance to condense is water.

If the temperature is lowered further, what is the next substance to condense?

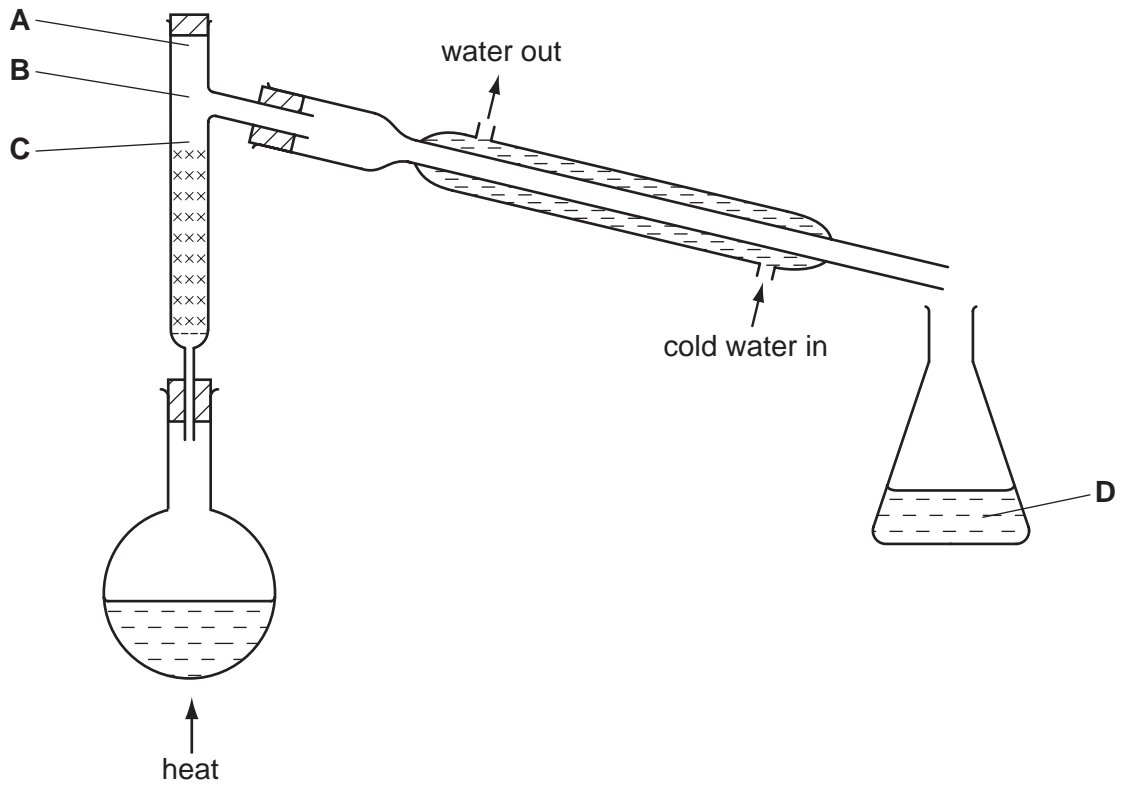
- A argon
  - B carbon dioxide
  - C nitrogen
  - D oxygen
- 2 Substance X dissolves in water to form a colourless solution. This solution reacts with aqueous lead(II) nitrate in the presence of dilute nitric acid to give a yellow precipitate.

What is substance X?

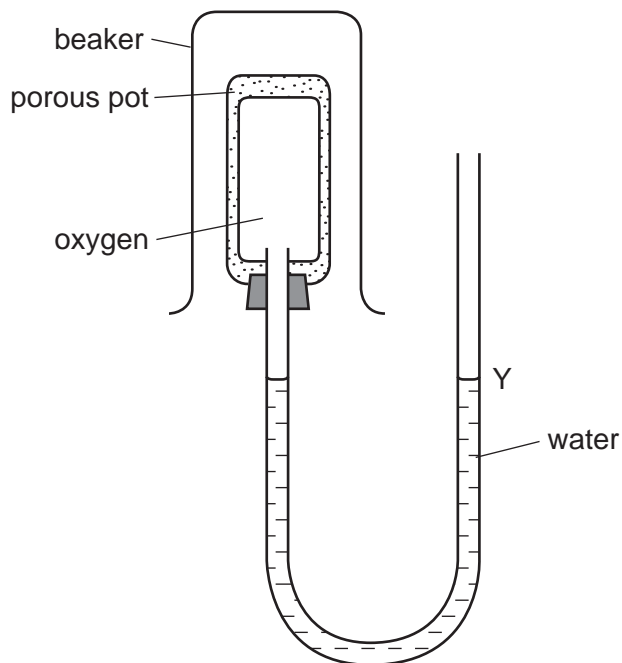
- A calcium iodide
- B copper(II) chloride
- C iron(II) iodide
- D sodium chloride

- 3 The fractional distillation apparatus shown is to be used for separating a mixture of two liquids. A thermometer is missing from the apparatus.

Where should the bulb of the thermometer be placed?



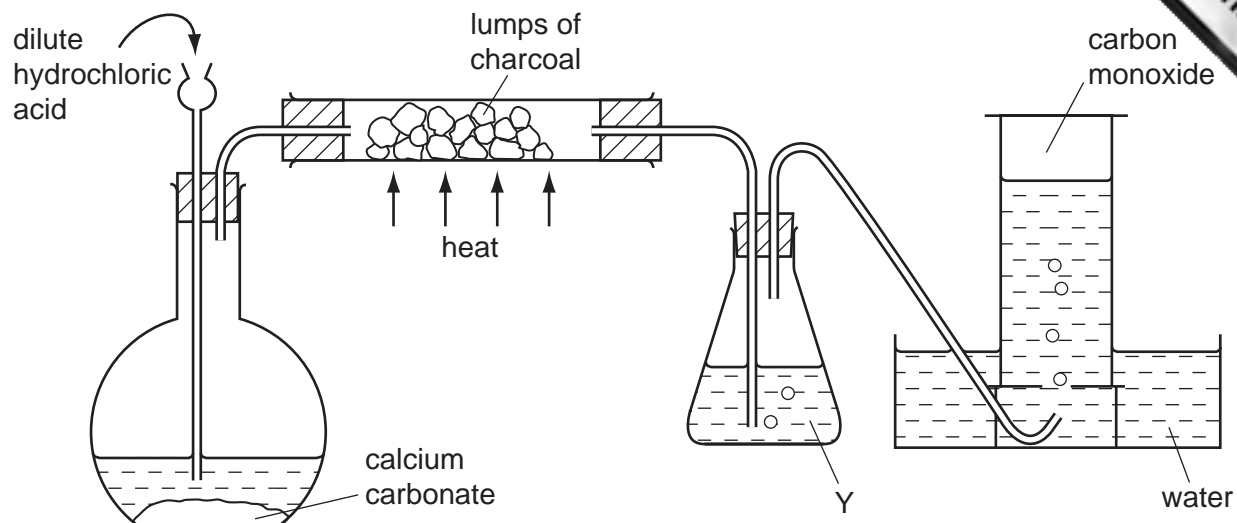
- 4 The diagram shows a diffusion experiment.



Which gas, when present in the beaker over the porous pot, will cause the water level at Y to rise?

- A carbon dioxide,  $\text{CO}_2$
  - B chlorine,  $\text{Cl}_2$
  - C methane,  $\text{CH}_4$
  - D nitrogen dioxide,  $\text{NO}_2$
- 5 Hydrogen can form both  $\text{H}^+$  ions and  $\text{H}^-$  ions.
- Which one of the statements below is correct?
- A An  $\text{H}^+$  ion has more protons than an  $\text{H}^-$  ion.
  - B An  $\text{H}^+$  ion has no electrons.
  - C An  $\text{H}^-$  ion has one more electron than an  $\text{H}^+$  ion.
  - D An  $\text{H}^-$  ion is formed when a hydrogen atom loses an electron.

- 6 The diagram shows apparatus used to obtain carbon monoxide.



What is the main purpose of Y?

- A** to dry the gas  
**B** to prevent water being sucked back on to the hot carbon  
**C** to remove carbon dioxide from the gas  
**D** to remove hydrogen chloride from the gas
- 7 A dark, shiny solid, X, conducts electricity.

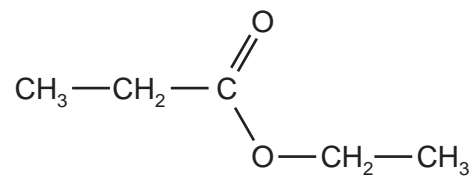
Oxygen combines with X to form a gaseous oxide.

What is X?

- A** graphite  
**B** iodine  
**C** iron  
**D** lead
- 8 Which substance could be sodium chloride?

	melting point / °C	conduction of electricity	
		when liquid	in aqueous solution
<b>A</b>	-114	nil	good
<b>B</b>	180	nil	nil (insoluble)
<b>C</b>	808	good	good
<b>D</b>	3550	nil	nil (insoluble)

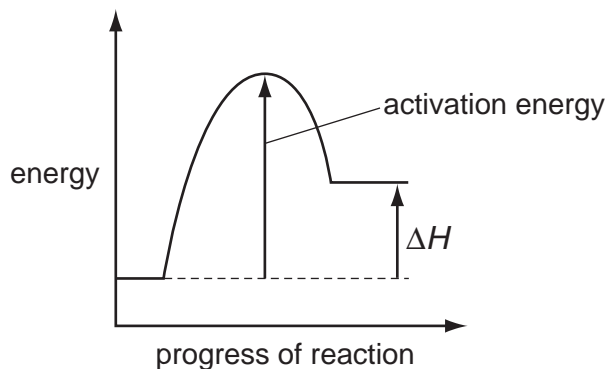
- 9 The diagram shows the molecule ethyl propanoate.



How many bonding pairs of electrons are there in the molecule?

- A** 13                      **B** 16                      **C** 17                      **D** 20
- 10 The conduction of electricity by metals is carried out by the movement of
- A** electrons only.  
**B** electrons and positive ions.  
**C** negative ions only.  
**D** negative ions and positive ions.
- 11 What is the concentration of iodine molecules,  $\text{I}_2$ , in a solution containing 2.54 g of iodine in  $250\text{ cm}^3$  of solution?
- A**  $0.01\text{ mol/dm}^3$   
**B**  $0.02\text{ mol/dm}^3$   
**C**  $0.04\text{ mol/dm}^3$   
**D**  $0.08\text{ mol/dm}^3$

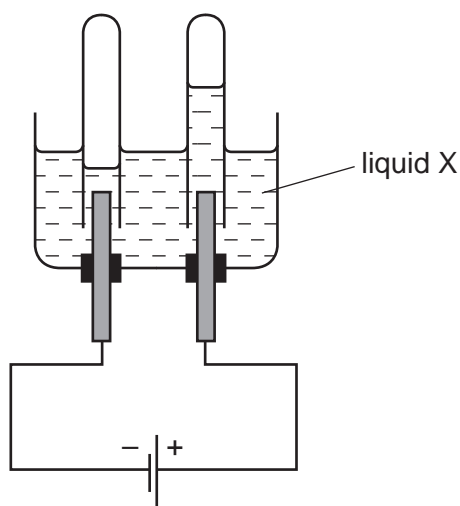
12 The energy profile for the forward direction of a **reversible** reaction is shown.



Which row correctly shows the sign of both the activation energy and the type of the enthalpy change for the **reverse** reaction?

	sign of activation energy	type of enthalpy change
<b>A</b>	negative	endothermic
<b>B</b>	negative	exothermic
<b>C</b>	positive	endothermic
<b>D</b>	positive	exothermic

13 The diagram shows the results of an electrolysis experiment using inert electrodes.



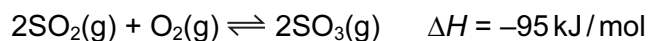
Which could be liquid X?

- A** aqueous copper(II) sulfate
- B** concentrated aqueous sodium chloride
- C** dilute sulfuric acid
- D** ethanol

14 In which reaction is nitric acid acting as an oxidising agent?

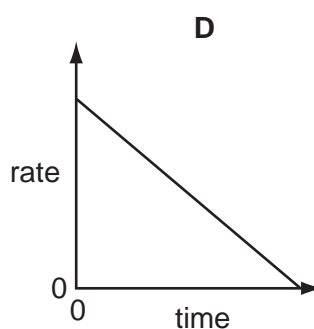
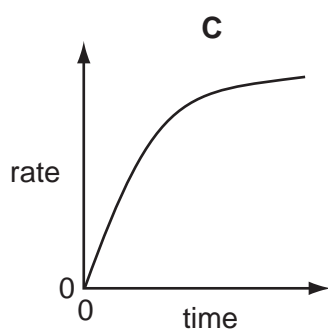
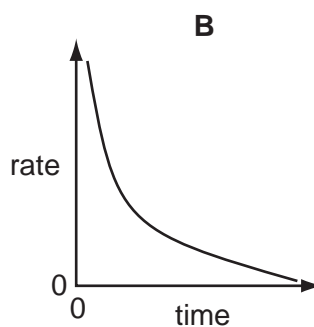
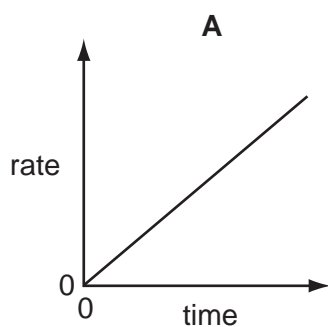
- A  $\text{Cu} + 4\text{HNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + 2\text{H}_2\text{O} + 2\text{NO}_2$
- B  $\text{CuO} + 2\text{HNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + \text{H}_2\text{O}$
- C  $\text{Na}_2\text{CO}_3 + 2\text{HNO}_3 \rightarrow 2\text{NaNO}_3 + \text{H}_2\text{O} + \text{CO}_2$
- D  $\text{NaOH} + \text{HNO}_3 \rightarrow \text{NaNO}_3 + \text{H}_2\text{O}$

15 The equation shows the formation of sulfur trioxide in the Contact process.



What would **decrease** the yield of sulfur trioxide in a given time?

- A addition of more oxygen
  - B an increase in pressure
  - C an increase in temperature
  - D removal of  $\text{SO}_3(\text{g})$  from the reaction chamber
- 16 Which graph represents how the rate of reaction varies with time when an excess of calcium carbonate reacts with dilute hydrochloric acid?





17 The tests below were carried out on a solution containing ions of the metal X.

test	observation
add sodium chloride solution	no change
add sodium sulfate solution	no change
add sodium hydroxide solution	a precipitate was formed, soluble in excess of the hydroxide

What is metal X?

- A calcium
- B iron
- C lead
- D zinc

18 A student mixed together aqueous solutions of Y and Z. A white precipitate formed.

Which could **not** be solutions Y and Z?

	solution Y	solution Z
A	hydrochloric acid	silver nitrate
B	hydrochloric acid	sodium nitrate
C	sodium chloride	lead(II) nitrate
D	sodium chloride	silver nitrate

19 Sulfur is burnt in air.

Which statement about this reaction is correct?

- A Sulfur is oxidised to sulfur trioxide.
- B The gas formed turns aqueous potassium dichromate(VI) from orange to green.
- C The reaction is reversible.
- D The reaction needs a catalyst.

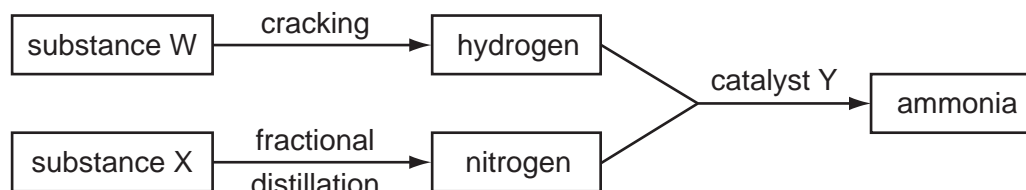
20 Which property is common to calcium, potassium and sodium?

- A Their atoms all lose two electrons when they form ions.
- B They all form carbonates which are insoluble in water.
- C They are all less dense than water.
- D They are all metallic.

21 Which set of the electronic structures are **only** found in metals?

- A** 2, 1            2, 8, 1            2, 8, 8, 1  
**B** 2, 5            2, 6                2, 7  
**C** 2, 7            2, 8, 7            2, 8, 18, 7  
**D** 2, 8, 3        2, 8, 4            2, 8, 5

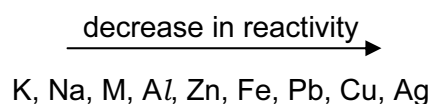
22 The diagram shows processes that take place in the manufacture of ammonia.



What are substances W and X and catalyst Y?

	W	X	Y
<b>A</b>	air	oil	iron
<b>B</b>	air	oil	vanadium(V) oxide
<b>C</b>	oil	air	iron
<b>D</b>	oil	air	vanadium(V) oxide

23 The position of metal M in the reactivity series is shown.



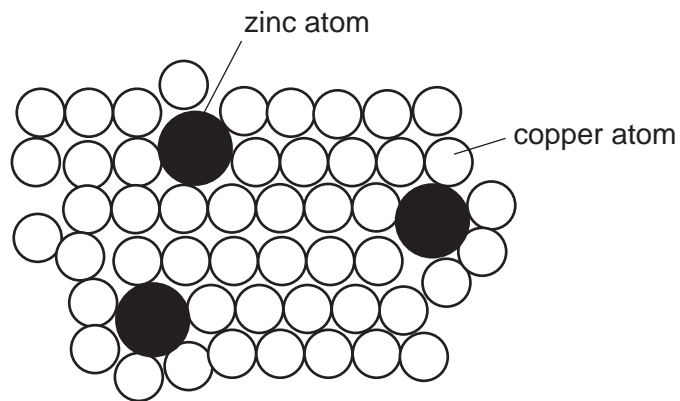
Which method will be used to extract M from its ore?

- A** electrolysis of its aqueous sulfate  
**B** electrolysis of its molten oxide  
**C** reduction of its oxide by heating with coke  
**D** reduction of its oxide by heating with hydrogen

- 24 When zinc is added to a solution of a metal sulfate, the metal is deposited and zinc ions are produced in solution.

Which metal is deposited?

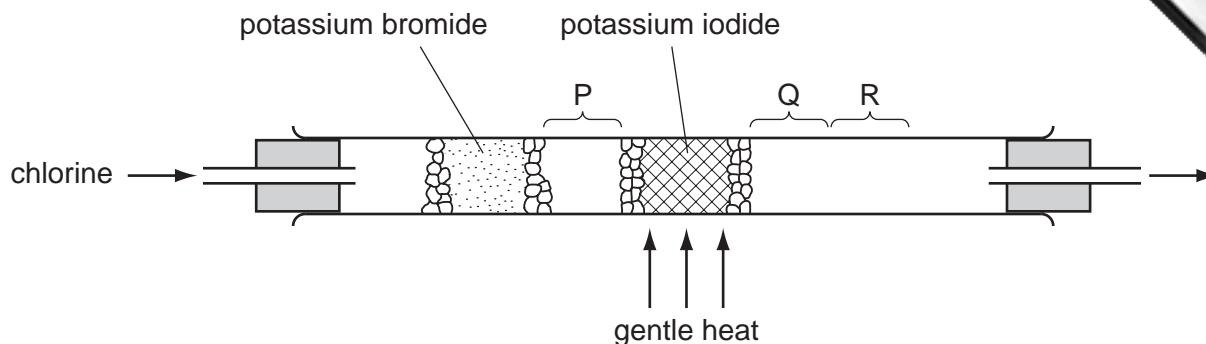
- A calcium
  - B copper
  - C magnesium
  - D potassium
- 25 The diagram shows the structure of brass.



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 solid.
- D Zinc atoms have more electrons than copper atoms.

26 Using the apparatus shown, chlorine is passed through the tube.

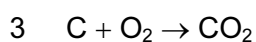
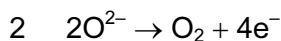
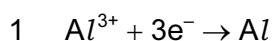


After a short time, coloured substances are seen at P, Q and R.

What are these coloured substances?

	at P	at Q	at R
<b>A</b>	green gas	red brown vapour	violet vapour
<b>B</b>	green gas	violet vapour	black solid
<b>C</b>	red brown vapour	violet vapour	black solid
<b>D</b>	violet vapour	red brown vapour	red brown vapour

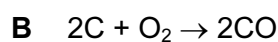
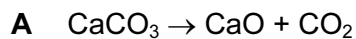
27 In the electrolysis of molten aluminium oxide for the extraction of aluminium, the following three reactions take place.



Which reactions take place at the anode?

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

28 Which equation in the blast furnace extraction of iron is **not** a redox reaction?



29 Which statement about the material used for aircraft bodies is correct?

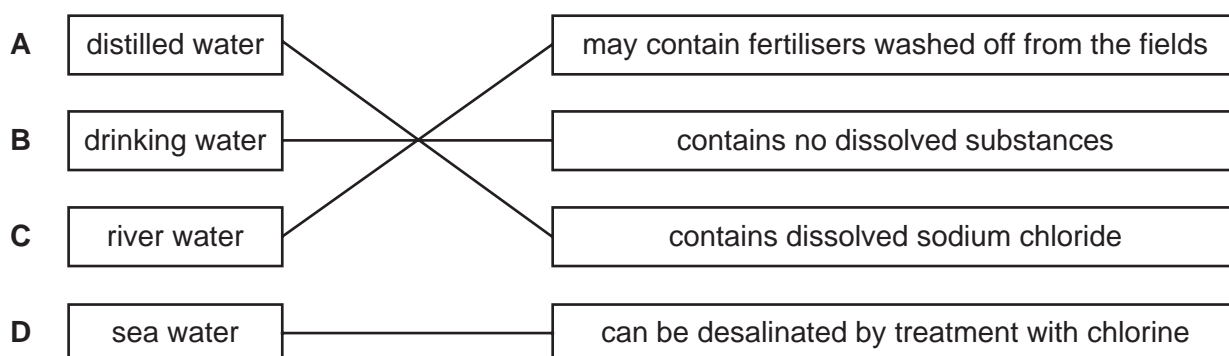
Aircraft bodies are made from

- A an aluminium alloy because pure aluminium is too soft.
- B pure aluminium because of its high melting point.
- C pure aluminium because of its low density.
- D pure aluminium because of its resistance to corrosion.

30 Which natural process can cause nitrogen oxides to be formed in the atmosphere?

- A bacterial decay of plants
- B lightning activity
- C photosynthesis
- D respiration

31 Which type of water in the left hand column is linked correctly to a statement in the right hand column?

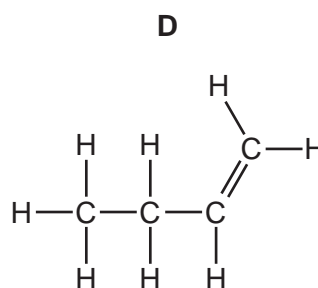
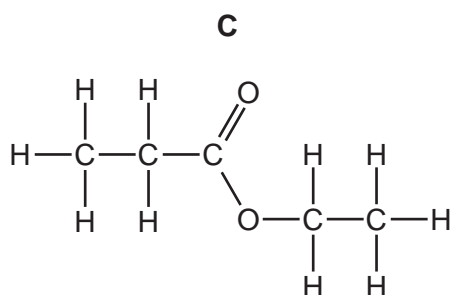
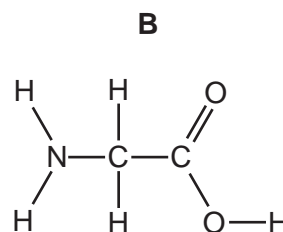
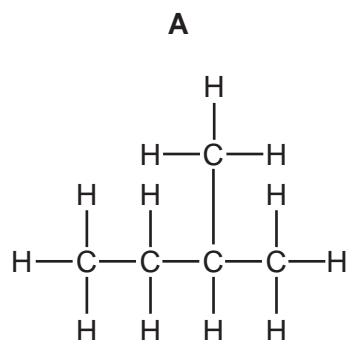


32 A catalytic converter in a car exhaust system speeds up the change of pollutants into less harmful products.

Which change does **not** occur in a catalytic converter?

- A carbon dioxide  $\rightarrow$  carbon
- B carbon monoxide  $\rightarrow$  carbon dioxide
- C nitrogen oxides  $\rightarrow$  nitrogen
- D unburned hydrocarbons  $\rightarrow$  carbon dioxide and water

33 Which formula represents a compound likely to undergo addition polymerisation?



34 Which statement about ethanol is correct?

- A** It is an unsaturated compound.
- B** It is formed by the catalytic addition of steam to ethene.
- C** It is formed by the oxidation of ethanoic acid.
- D** It reacts with ethyl ethanoate to form an acid.

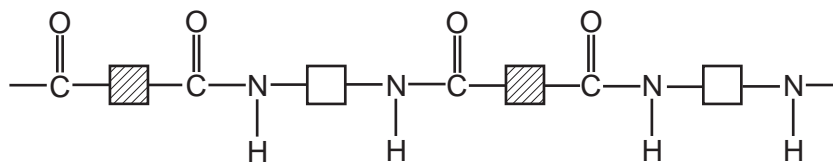
35 An organic compound has an empirical formula  $C_2H_4O$ .

What is the compound?

- A** butanoic acid
- B** butanol
- C** ethanoic acid
- D** ethanol



38 Polymer X has the structure shown.



The list shows four terms that can be applied to polymers.

- 1 addition polymer
- 2 condensation polymer
- 3 polyamide
- 4 polyester

Which two terms can be applied to polymer X?

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

39 In which reaction is water produced?

- A** manufacture of ethanol from ethene
- B** manufacture of margarine from vegetable oils
- C** manufacture of poly(ethene) from ethene
- D** manufacture of *Terylene* from a carboxylic acid and an alcohol

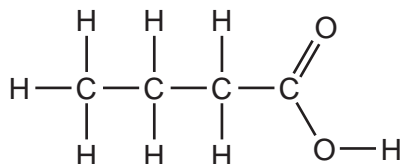


40 The results of tests on compound Z are shown.

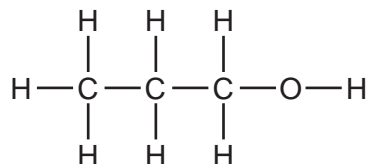
test	result
add bromine water	turns colourless
add aqueous sodium carbonate	carbon dioxide formed

What is compound Z?

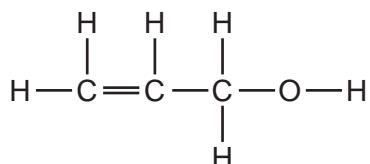
**A**



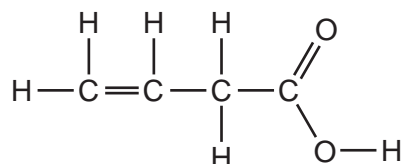
**B**



**C**



**D**







**DATA SHEET**  
**The Periodic Table of the Elements**

Group		III	IV	V	VI	VII	0
I	II	11 <b>B</b> Boron 5	12 <b>C</b> Carbon 6	14 <b>N</b> Nitrogen 7	16 <b>O</b> Oxygen 8	19 <b>F</b> Fluorine 9	20 <b>Ne</b> Neon 10
7 <b>Li</b> Lithium 3	9 <b>Be</b> Beryllium 4	13 <b>Al</b> Aluminium 13	14 <b>Si</b> Silicon 14	15 <b>P</b> Phosphorus 15	16 <b>S</b> Sulfur 16	17 <b>Cl</b> Chlorine 17	18 <b>Ar</b> Argon 18
23 <b>Na</b> Sodium 11	24 <b>Mg</b> Magnesium 12	27 <b>Fe</b> Iron 26	28 <b>Ni</b> Nickel 28	29 <b>Cu</b> Copper 29	30 <b>Zn</b> Zinc 30	35 <b>Br</b> Bromine 35	36 <b>Kr</b> Krypton 36
39 <b>K</b> Potassium 19	40 <b>Ca</b> Calcium 20	41 <b>Nb</b> Niobium 41	42 <b>Mo</b> Molybdenum 42	43 <b>Tc</b> Technetium 43	44 <b>Ru</b> Ruthenium 44	45 <b>Rh</b> Rhodium 45	46 <b>Pd</b> Palladium 46
85 <b>Rb</b> Rubidium 37	88 <b>Sr</b> Strontium 38	73 <b>Ga</b> Gallium 31	74 <b>Ge</b> Germanium 32	75 <b>As</b> Arsenic 33	76 <b>Se</b> Selenium 34	77 <b>Te</b> Tellurium 52	78 <b>I</b> Iodine 53
133 <b>Cs</b> Caesium 55	137 <b>Ba</b> Barium 56	81 <b>Tl</b> Thallium 81	82 <b>Pb</b> Lead 82	83 <b>Bi</b> Bismuth 83	84 <b>Po</b> Polonium 84	127 <b>Xe</b> Xenon 54	131 <b>Rn</b> Radon 86
87 <b>Fr</b> Francium 87	226 <b>Ra</b> Radium 88	201 <b>Hg</b> Mercury 80	197 <b>Au</b> Gold 79	195 <b>Pt</b> Platinum 78	204 <b>Pb</b> Lead 82	128 <b>Te</b> Tellurium 52	131 <b>Xe</b> Xenon 54
		59 <b>Co</b> Cobalt 27	58 <b>Ni</b> Nickel 28	64 <b>Cu</b> Copper 29	65 <b>Zn</b> Zinc 30	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54
		55 <b>Mn</b> Manganese 25	56 <b>Fe</b> Iron 26	59 <b>Co</b> Cobalt 27	64 <b>Cu</b> Copper 29	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54
		52 <b>Cr</b> Chromium 24	55 <b>Mn</b> Manganese 25	59 <b>Co</b> Cobalt 27	64 <b>Cu</b> Copper 29	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54
		51 <b>V</b> Vanadium 23	55 <b>Mn</b> Manganese 25	59 <b>Co</b> Cobalt 27	64 <b>Cu</b> Copper 29	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54
		48 <b>Ti</b> Titanium 22	55 <b>Mn</b> Manganese 25	59 <b>Co</b> Cobalt 27	64 <b>Cu</b> Copper 29	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54
		45 <b>Sc</b> Scandium 21	55 <b>Mn</b> Manganese 25	59 <b>Co</b> Cobalt 27	64 <b>Cu</b> Copper 29	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54
		89 <b>Y</b> Yttrium 39	55 <b>Mn</b> Manganese 25	59 <b>Co</b> Cobalt 27	64 <b>Cu</b> Copper 29	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54
		139 <b>La</b> Lanthanum 57	55 <b>Mn</b> Manganese 25	59 <b>Co</b> Cobalt 27	64 <b>Cu</b> Copper 29	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54
		178 <b>Hf</b> Hafnium 72	55 <b>Mn</b> Manganese 25	59 <b>Co</b> Cobalt 27	64 <b>Cu</b> Copper 29	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54
		181 <b>Ta</b> Tantalum 73	55 <b>Mn</b> Manganese 25	59 <b>Co</b> Cobalt 27	64 <b>Cu</b> Copper 29	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54
		184 <b>W</b> Tungsten 74	55 <b>Mn</b> Manganese 25	59 <b>Co</b> Cobalt 27	64 <b>Cu</b> Copper 29	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54
		190 <b>Os</b> Osmium 76	55 <b>Mn</b> Manganese 25	59 <b>Co</b> Cobalt 27	64 <b>Cu</b> Copper 29	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54
		192 <b>Ir</b> Iridium 77	55 <b>Mn</b> Manganese 25	59 <b>Co</b> Cobalt 27	64 <b>Cu</b> Copper 29	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54
		195 <b>Pt</b> Platinum 78	55 <b>Mn</b> Manganese 25	59 <b>Co</b> Cobalt 27	64 <b>Cu</b> Copper 29	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54
		201 <b>Hg</b> Mercury 80	55 <b>Mn</b> Manganese 25	59 <b>Co</b> Cobalt 27	64 <b>Cu</b> Copper 29	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54
		159 <b>Tb</b> Terbium 65	152 <b>Eu</b> Europium 63	157 <b>Gd</b> Gadolinium 64	162 <b>Dy</b> Dysprosium 66	167 <b>Er</b> Erbium 68	173 <b>Yb</b> Ytterbium 70
		140 <b>Ce</b> Cerium 58	144 <b>Nd</b> Neodymium 60	149 <b>Pr</b> Praseodymium 59	152 <b>Eu</b> Europium 63	157 <b>Gd</b> Gadolinium 64	162 <b>Dy</b> Dysprosium 66
		232 <b>Th</b> Thorium 90	238 <b>U</b> Uranium 92	234 <b>Pa</b> Protactinium 91	238 <b>U</b> Uranium 92	234 <b>Pa</b> Protactinium 91	238 <b>U</b> Uranium 92
		150 <b>Sm</b> Samarium 62	144 <b>Nd</b> Neodymium 60	149 <b>Pr</b> Praseodymium 59	152 <b>Eu</b> Europium 63	157 <b>Gd</b> Gadolinium 64	162 <b>Dy</b> Dysprosium 66
		152 <b>Eu</b> Europium 63	144 <b>Nd</b> Neodymium 60	149 <b>Pr</b> Praseodymium 59	152 <b>Eu</b> Europium 63	157 <b>Gd</b> Gadolinium 64	162 <b>Dy</b> Dysprosium 66
		157 <b>Gd</b> Gadolinium 64	144 <b>Nd</b> Neodymium 60	149 <b>Pr</b> Praseodymium 59	152 <b>Eu</b> Europium 63	157 <b>Gd</b> Gadolinium 64	162 <b>Dy</b> Dysprosium 66
		162 <b>Dy</b> Dysprosium 66	144 <b>Nd</b> Neodymium 60	149 <b>Pr</b> Praseodymium 59	152 <b>Eu</b> Europium 63	157 <b>Gd</b> Gadolinium 64	162 <b>Dy</b> Dysprosium 66
		167 <b>Er</b> Erbium 68	144 <b>Nd</b> Neodymium 60	149 <b>Pr</b> Praseodymium 59	152 <b>Eu</b> Europium 63	157 <b>Gd</b> Gadolinium 64	162 <b>Dy</b> Dysprosium 66
		169 <b>Tm</b> Thulium 69	144 <b>Nd</b> Neodymium 60	149 <b>Pr</b> Praseodymium 59	152 <b>Eu</b> Europium 63	157 <b>Gd</b> Gadolinium 64	162 <b>Dy</b> Dysprosium 66
		173 <b>Yb</b> Ytterbium 70	144 <b>Nd</b> Neodymium 60	149 <b>Pr</b> Praseodymium 59	152 <b>Eu</b> Europium 63	157 <b>Gd</b> Gadolinium 64	162 <b>Dy</b> Dysprosium 66
		175 <b>Lu</b> Lutetium 71	144 <b>Nd</b> Neodymium 60	149 <b>Pr</b> Praseodymium 59	152 <b>Eu</b> Europium 63	157 <b>Gd</b> Gadolinium 64	162 <b>Dy</b> Dysprosium 66
		101 <b>Md</b> Mendelevium 101	100 <b>Fm</b> Fermium 100	99 <b>Es</b> Einsteinium 99	98 <b>Cf</b> Californium 98	97 <b>Bk</b> Berkelium 97	96 <b>Cm</b> Curium 96
		102 <b>No</b> Nobelium 102	100 <b>Fm</b> Fermium 100	99 <b>Es</b> Einsteinium 99	98 <b>Cf</b> Californium 98	97 <b>Bk</b> Berkelium 97	96 <b>Cm</b> Curium 96
		103 <b>Lr</b> Lawrencium 103	100 <b>Fm</b> Fermium 100	99 <b>Es</b> Einsteinium 99	98 <b>Cf</b> Californium 98	97 <b>Bk</b> Berkelium 97	96 <b>Cm</b> Curium 96

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

**Key**

a	X
b	

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.).

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