



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CHEMISTRY

5070/11

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)



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.

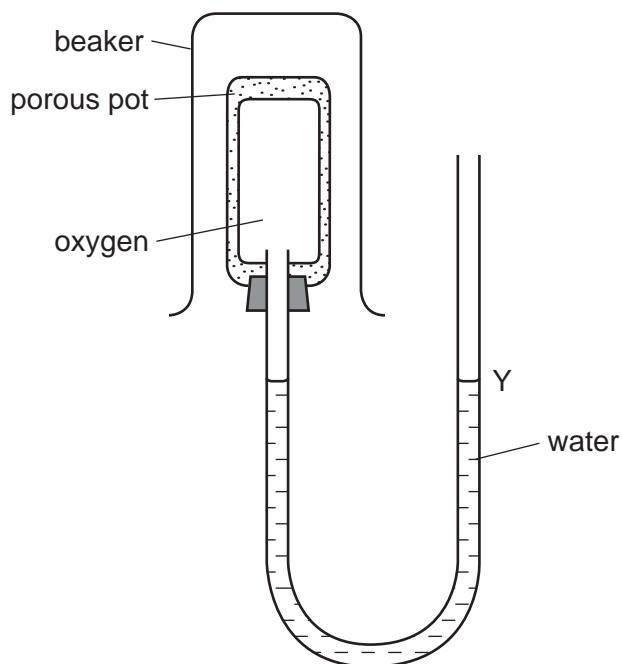
This document consists of **16** printed pages.



- 1 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?

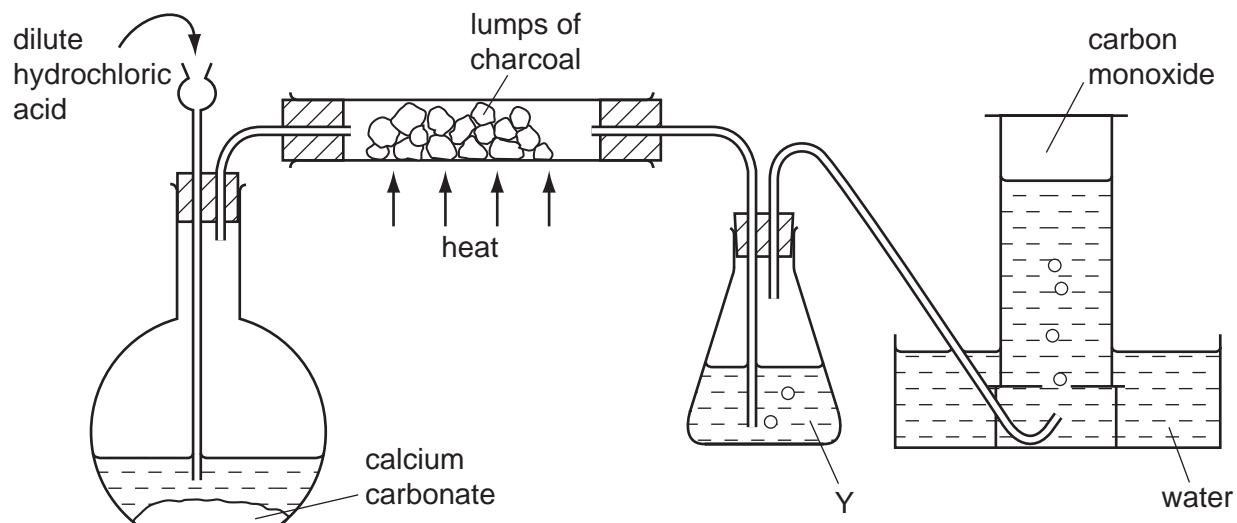
- A calcium iodide
 - B copper(II) chloride
 - C iron(II) iodide
 - D sodium chloride
- 2 The diagram shows a diffusion experiment.



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

- A carbon dioxide, CO_2
- B chlorine, Cl_2
- C methane, CH_4
- D nitrogen dioxide, NO_2

- 3 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
- 4 The boiling points of various gases found in the air are shown below.

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

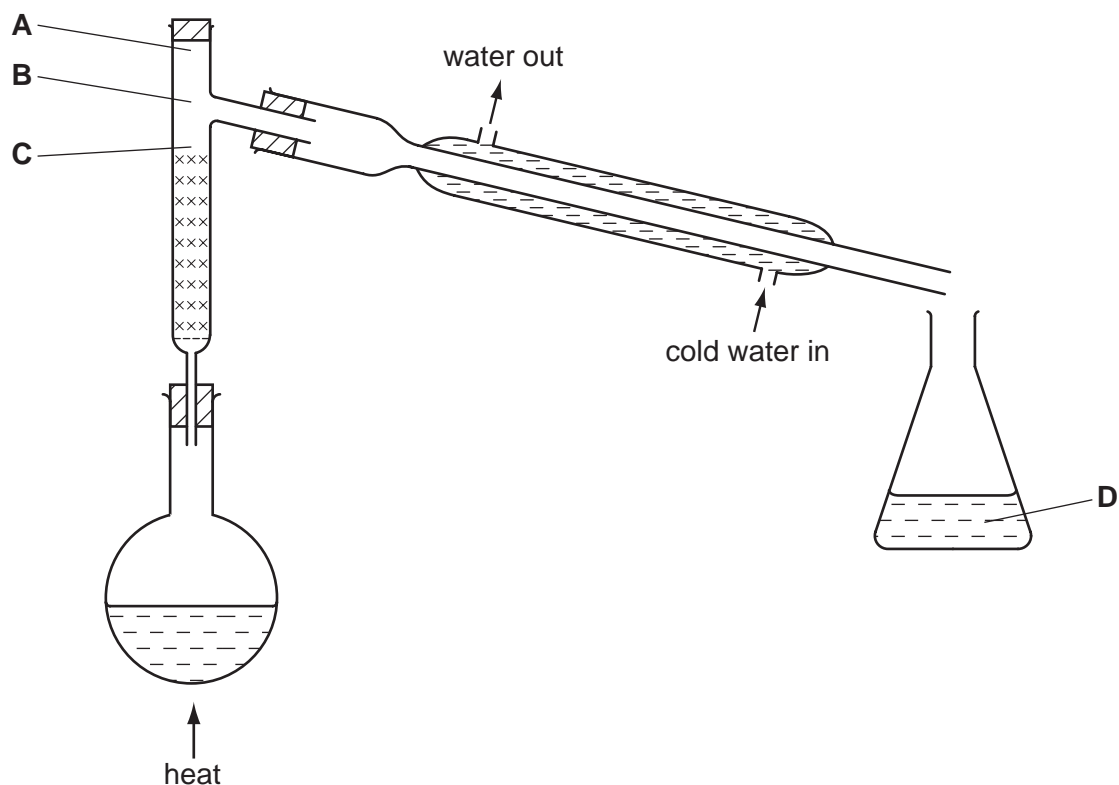
If the air is cooled, the first substance to condense is water.

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

- A argon
- B carbon dioxide
- C nitrogen
- D oxygen

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

Where should the bulb of the thermometer be placed?



- 6 Hydrogen can form both H^+ ions and H^- ions.

Which one of the statements below is correct?

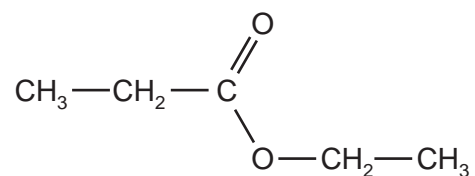
- A** An H^+ ion has more protons than an H^- ion.
B An H^+ ion has no electrons.
C An H^- ion has one more electron than an H^+ ion.
D An H^- ion is formed when a hydrogen atom loses an electron.
- 7 A dark, shiny solid, X, conducts electricity.

Oxygen combines with X to form a gaseous oxide.

What is X?

- A** graphite
B iodine
C iron
D lead

- 8 The diagram shows the molecule ethyl propanoate.



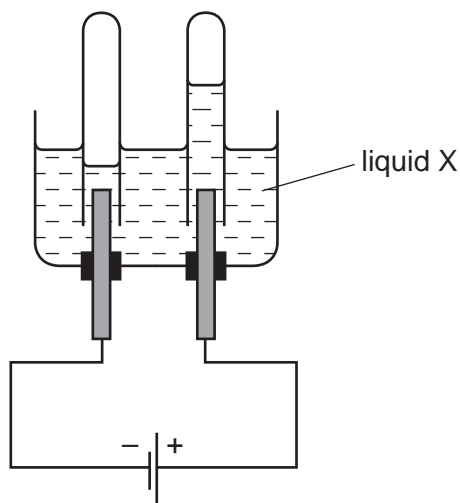
How many bonding pairs of electrons are there in the molecule?

- A** 13 **B** 16 **C** 17 **D** 20
- 9 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.
- 10 Which substance could be sodium chloride?

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

- 11 What is the concentration of iodine molecules, I₂, in a solution containing 2.54 g of iodine in 250 cm³ of solution?
- A** 0.01 mol/dm³
B 0.02 mol/dm³
C 0.04 mol/dm³
D 0.08 mol/dm³

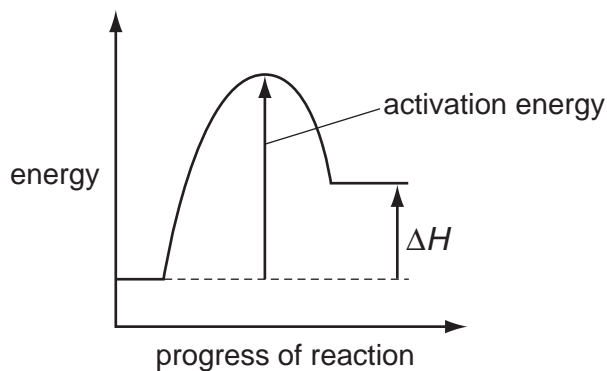
12 The diagram shows the results of an electrolysis experiment using inert electrodes.



Which could be liquid X?

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

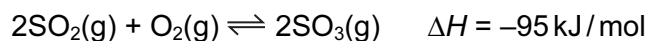
13 The energy profile for the forward direction of a **reversible** reaction is shown.



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

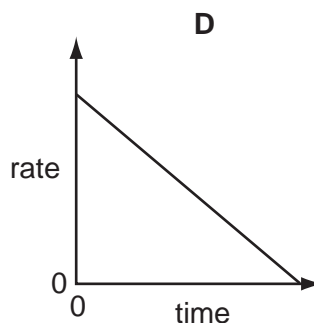
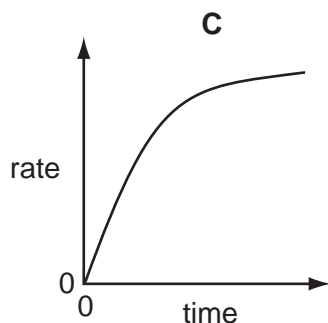
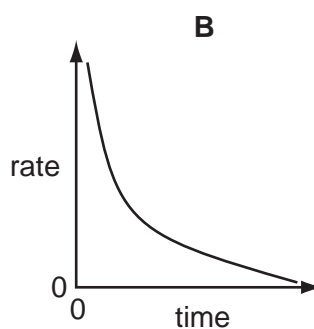
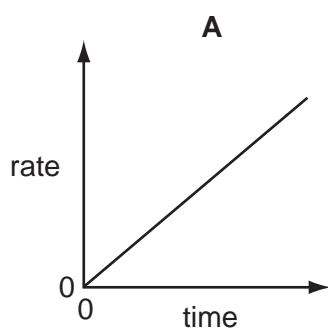
	sign of activation energy	type of enthalpy change
A	negative	endothermic
B	negative	exothermic
C	positive	endothermic
D	positive	exothermic

- 14 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
- 15 Which graph represents how the rate of reaction varies with time when an excess of calcium carbonate reacts with dilute hydrochloric acid?



- 16 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 $\text{NaOH} + \text{HNO}_3 \rightarrow \text{NaNO}_3 + \text{H}_2\text{O}$

17 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

18 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

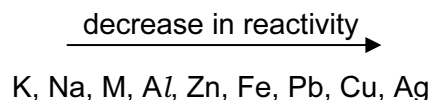
19 Which property is common to calcium, potassium and sodium?

- 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.

20 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

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



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

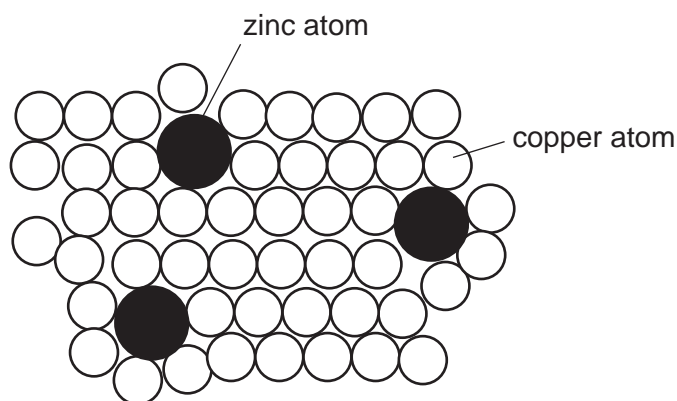
- A electrolysis of its aqueous sulfate
- B electrolysis of its molten oxide
- C reduction of its oxide by heating with coke
- D reduction of its oxide by heating with hydrogen

22 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

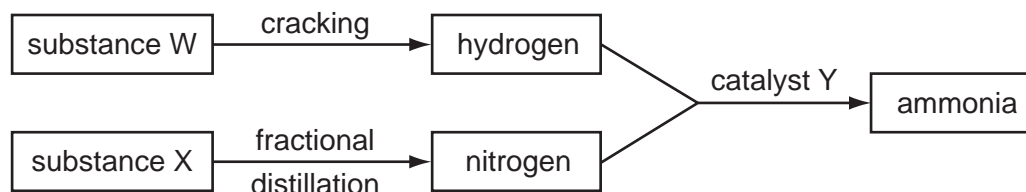
23 The diagram shows the structure of brass.



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.

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



What are substances W and X and catalyst Y?

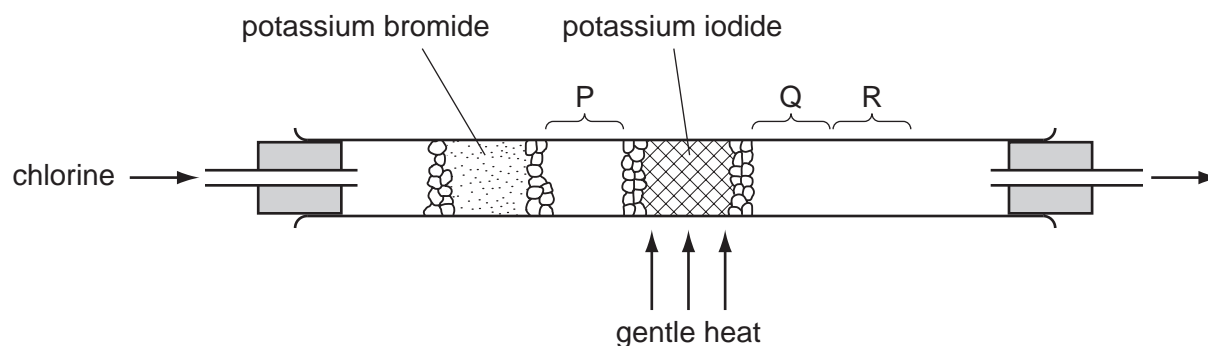
	W	X	Y
A	air	oil	iron
B	air	oil	vanadium(V) oxide
C	oil	air	iron
D	oil	air	vanadium(V) oxide

25 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.

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
A	green gas	red brown vapour	violet vapour
B	green gas	violet vapour	black solid
C	red brown vapour	violet vapour	black solid
D	violet vapour	red brown vapour	red brown vapour

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

- A** $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
- B** $2\text{C} + \text{O}_2 \rightarrow 2\text{CO}$
- C** $\text{C} + \text{CO}_2 \rightarrow 2\text{CO}$
- D** $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$

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

- 1 $\text{Al}^{3+} + 3\text{e}^- \rightarrow \text{Al}$
- 2 $2\text{O}^{2-} \rightarrow \text{O}_2 + 4\text{e}^-$
- 3 $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$

Which reactions take place at the anode?

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

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

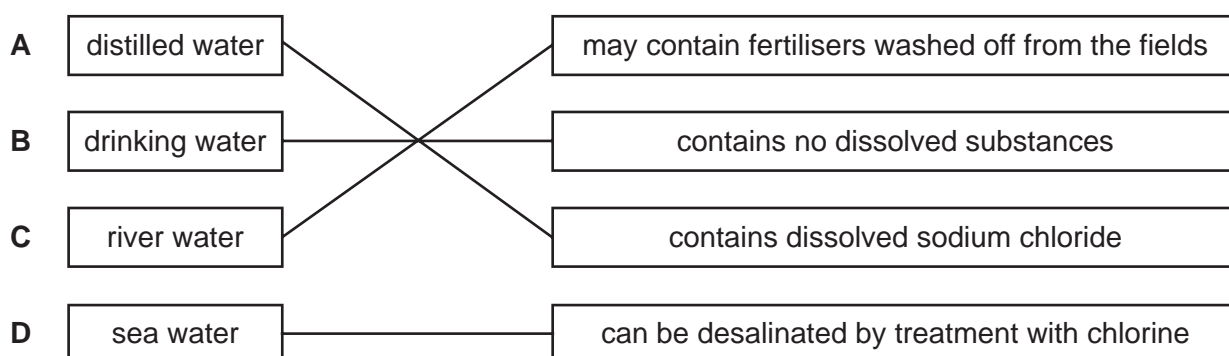
Which change does **not** occur in a catalytic converter?

- A carbon dioxide → carbon
- B carbon monoxide → carbon dioxide
- C nitrogen oxides → nitrogen
- D unburned hydrocarbons → carbon dioxide and water

31 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

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

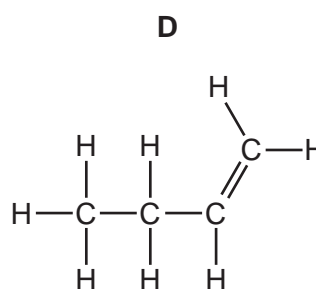
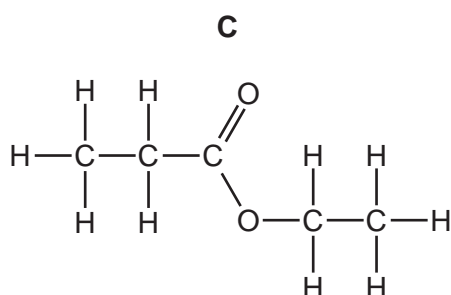
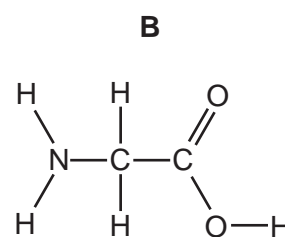
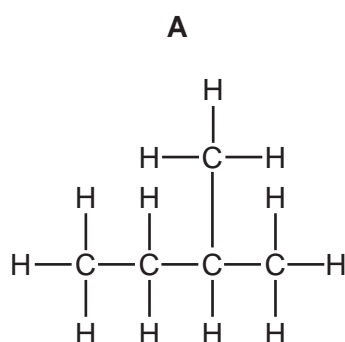


33 An organic compound has an empirical formula C_2H_4O .

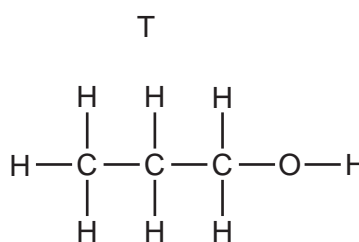
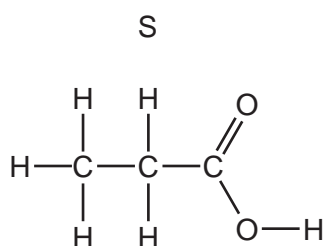
What is the compound?

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

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



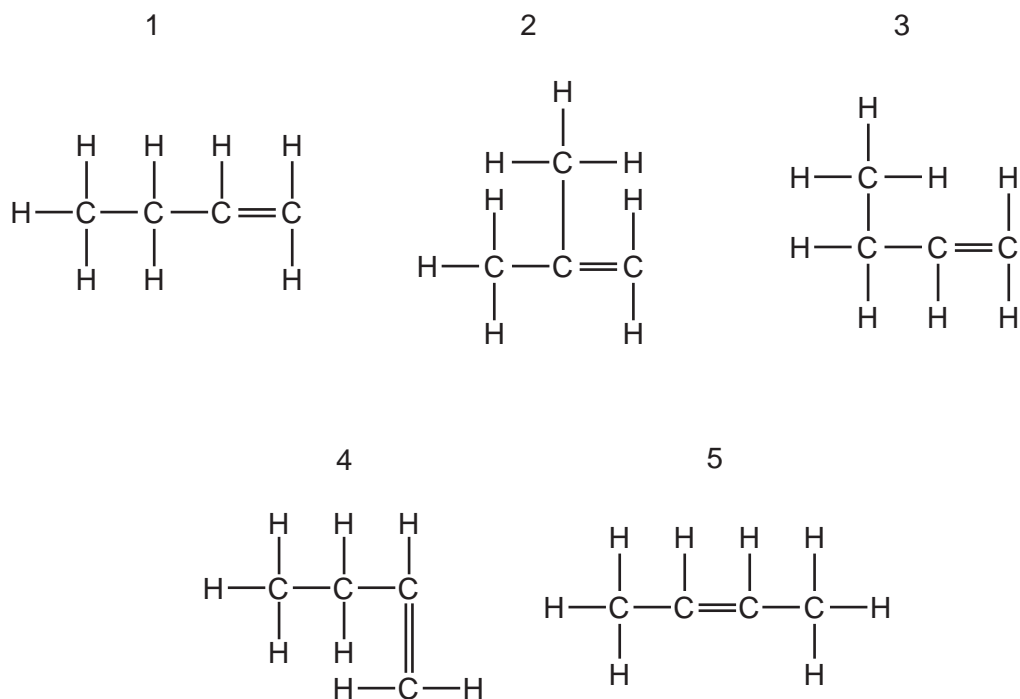
35 The diagrams show two organic compounds.



Which statement about the compounds S and T is correct?

- A Both S and T react with sodium carbonate.
- B S and T react together to form the ester ethyl propanoate.
- C T can be changed into S using acidified potassium dichromate(VI).
- D They are in the same homologous series.

36 Five structures are shown.



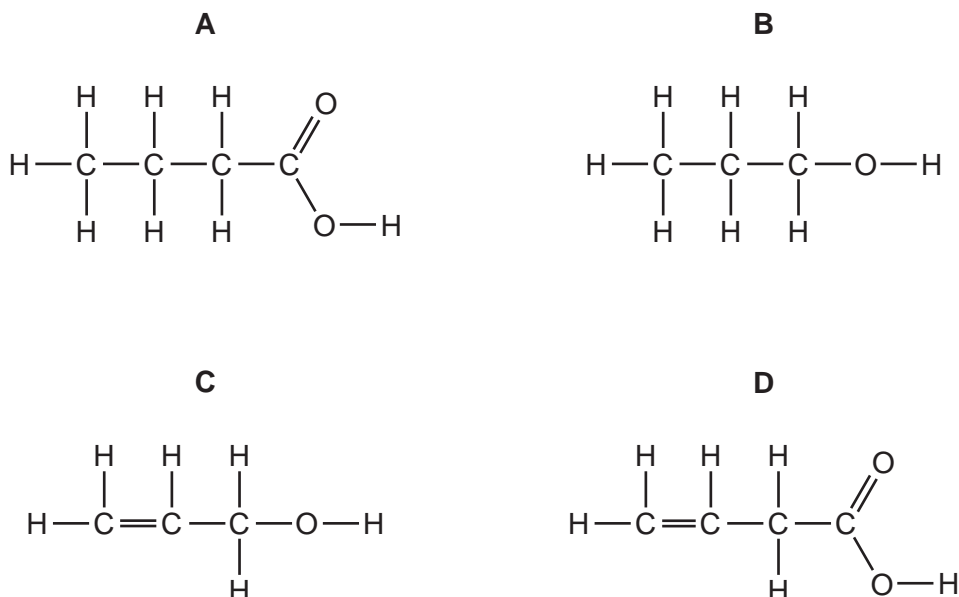
Which structures represent identical molecules?

- A** 1 and 3 only
- B** 2 and 3 only
- C** 1, 3 and 4 only
- D** 1, 3 and 5 only
- 37 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.
- 38 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

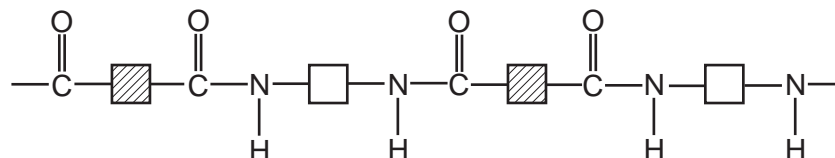
39 The results of tests on compound Z are shown.

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

What is compound Z?



40 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

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	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10	23 Na Sodium 11	24 Mg Magnesium 12	27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulfur 16	35.5 Cl Chlorine 17	40 Ar Argon 18	39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36	85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	101 Ru Ruthenium 44	106 Pd Palladium 46	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	127 I Iodine 53	131 Xe Xenon 54	133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	210 Po Polonium 84	210 At Astatine 85	210 Rn Radon 86	226 Ra Radium 88	227 Ac Actinium 89	†
												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	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																													

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

Key

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

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

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