



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

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)



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?

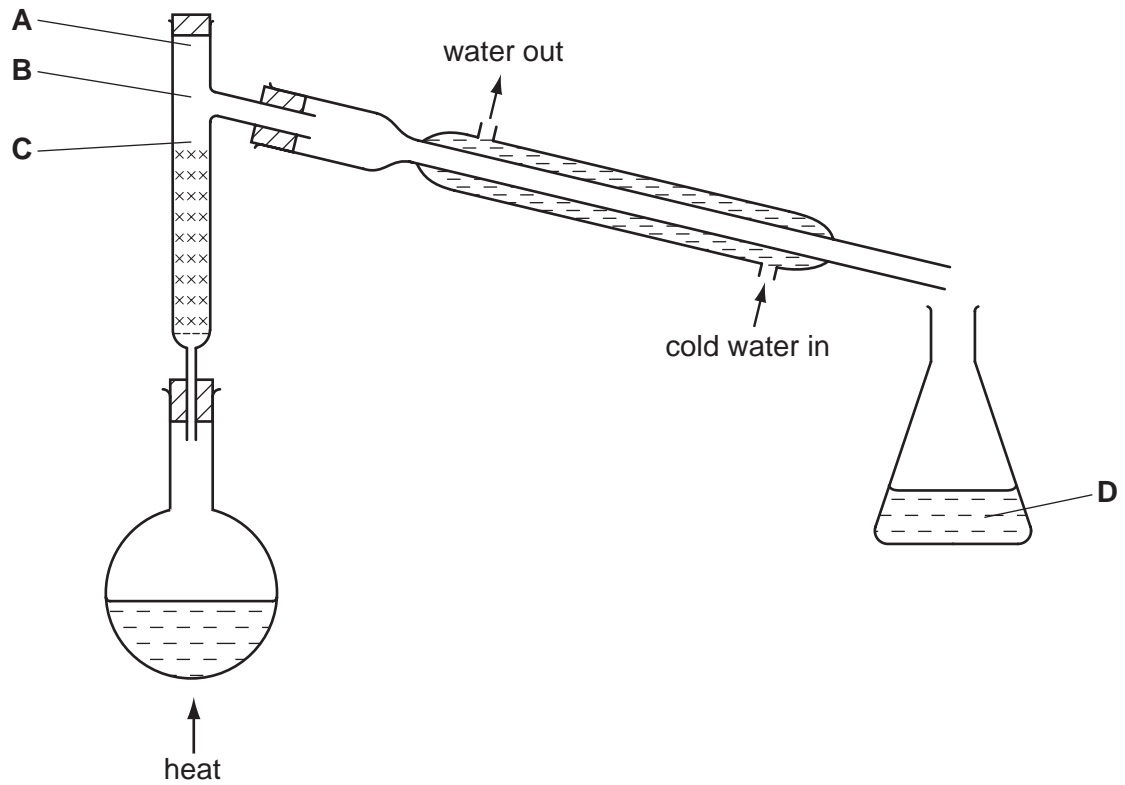
- A argon
 - B carbon dioxide
 - C nitrogen
 - D oxygen
- 2 Substance X dissolves in water to form a colourless solution. This solution reacts with aqueous lead(II) nitrate in the presence of dilute nitric acid to give a yellow precipitate.

What is substance X?

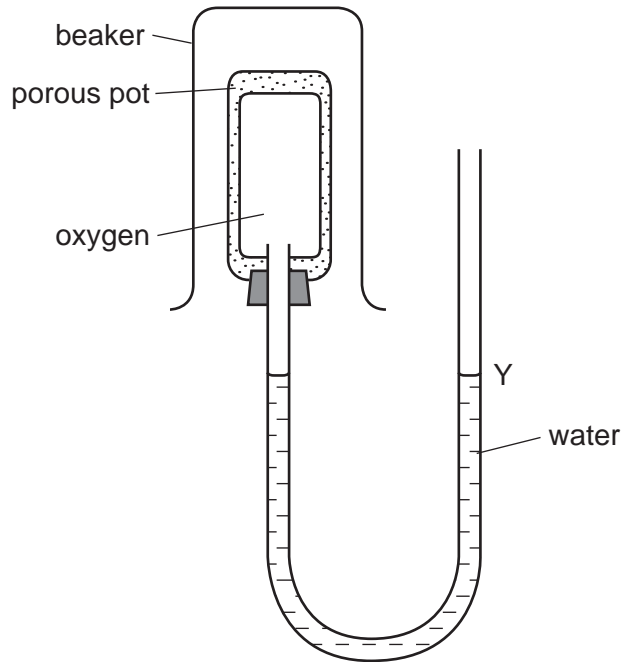
- A calcium iodide
- B copper(II) chloride
- C iron(II) iodide
- D sodium chloride

- 3 The fractional distillation apparatus shown is to be used for separating a mixture of two colourless 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?

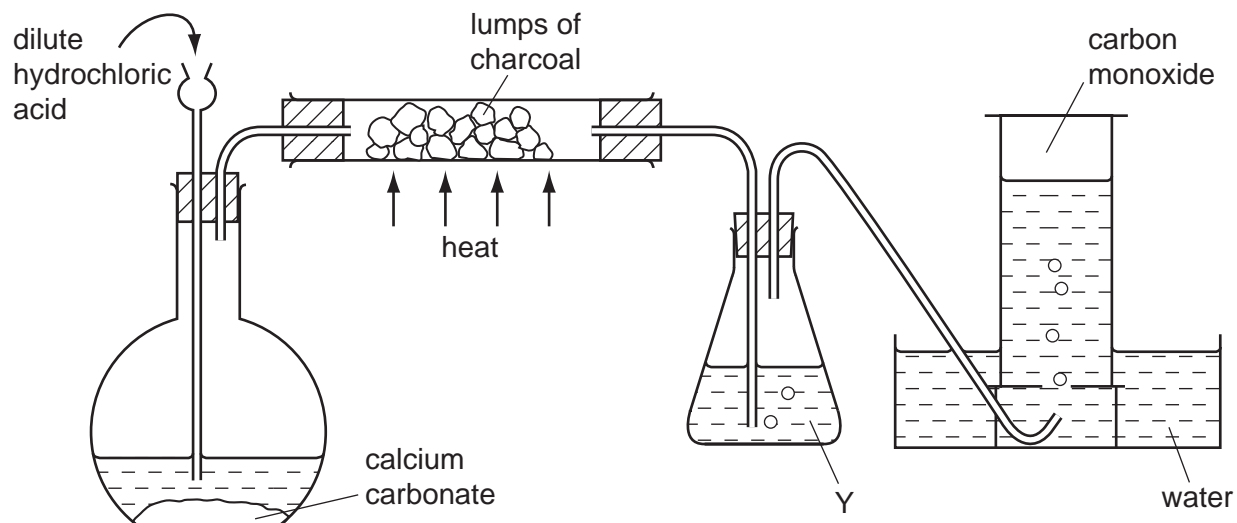
- A carbon dioxide, CO_2
- B chlorine, Cl_2
- C methane, CH_4
- D nitrogen dioxide, NO_2

5 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.

- 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.

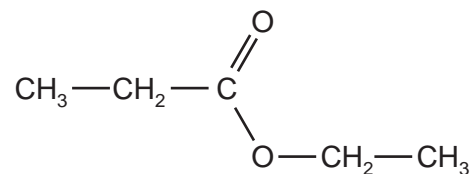
Oxygen combines with X to form a gaseous oxide.

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
A	-114	nil	good
B	180	nil	nil (insoluble)
C	808	good	good
D	3550	nil	nil (insoluble)

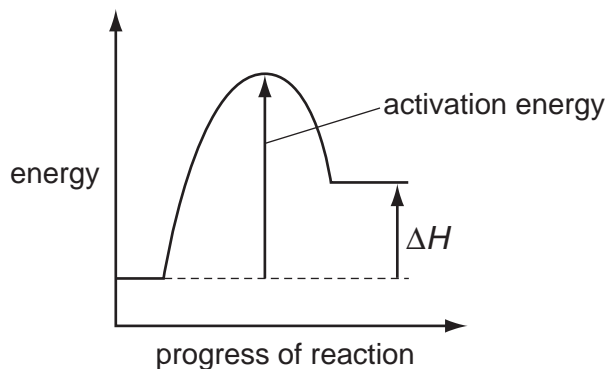
- 9 The diagram shows the molecule ethyl propanoate.



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, I_2 , in a solution containing 2.54 g of iodine in 250 cm^3 of solution?
- A** 0.01 mol/dm^3
B 0.02 mol/dm^3
C 0.04 mol/dm^3
D 0.08 mol/dm^3

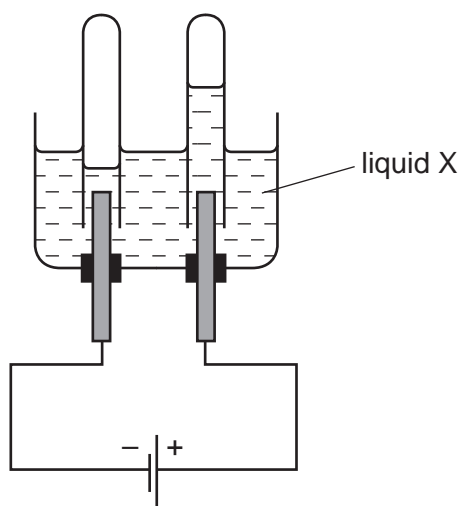
12 The energy profile for the forward direction of a **reversible** reaction is shown.



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
A	negative	endothermic
B	negative	exothermic
C	positive	endothermic
D	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?

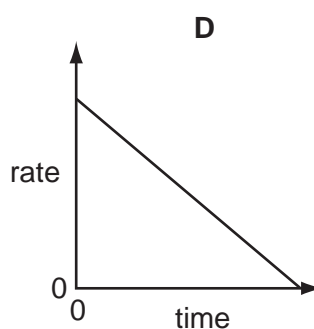
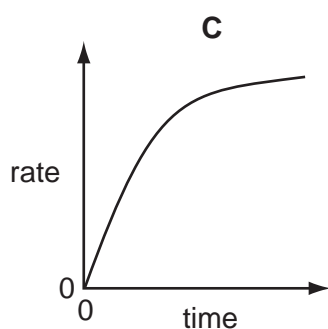
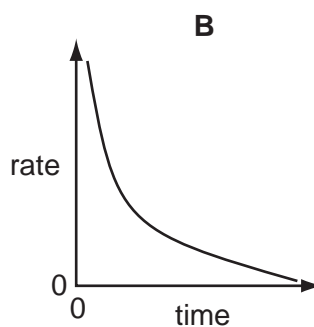
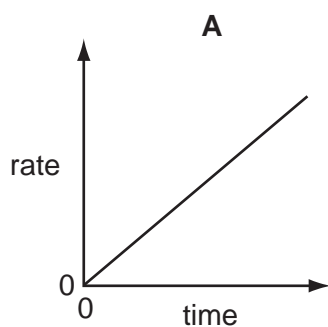
- A $\text{Cu} + 4\text{HNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + 2\text{H}_2\text{O} + 2\text{NO}_2$
 B $\text{CuO} + 2\text{HNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + \text{H}_2\text{O}$
 C $\text{Na}_2\text{CO}_3 + 2\text{HNO}_3 \rightarrow 2\text{NaNO}_3 + \text{H}_2\text{O} + \text{CO}_2$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

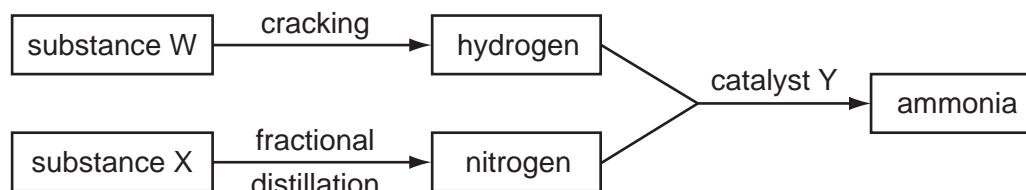
20 Which property is common to calcium, potassium and sodium?

- 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

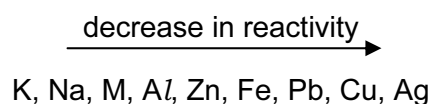
22 The diagram shows processes that take place in the manufacture of ammonia.



What are substances W and X and catalyst Y?

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

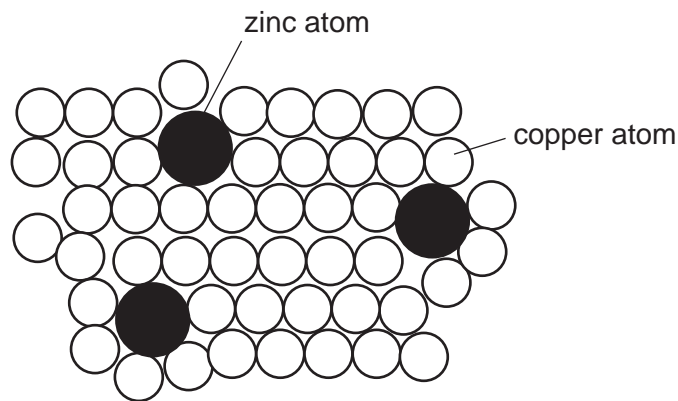
- A** electrolysis of its aqueous sulfate
B electrolysis of its molten oxide
C reduction of its oxide by heating with coke
D reduction of its oxide by heating with hydrogen

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

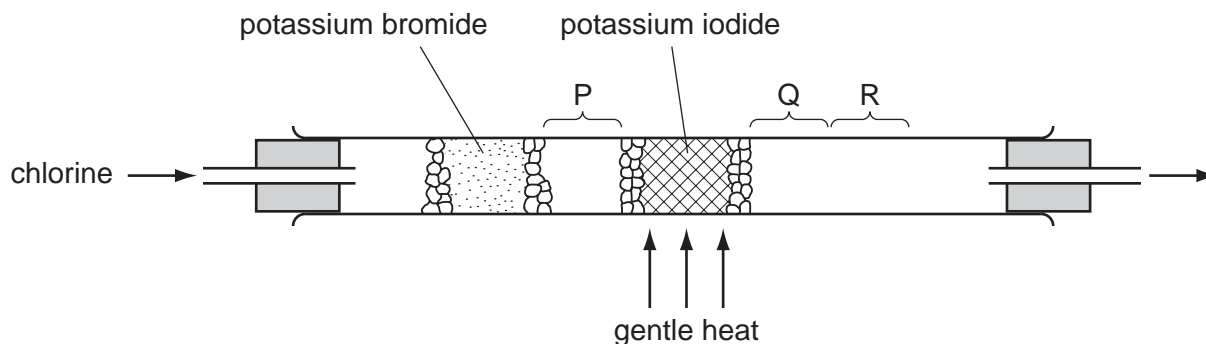
25 The diagram shows the structure of brass.



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.

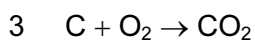
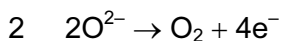
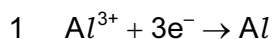


After a short time, coloured substances are seen at P, Q and R.

What are these coloured substances?

	at P	at Q	at R
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

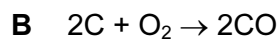
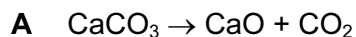
27 In the electrolysis of molten aluminium oxide for the extraction of aluminium, the following three reactions take place.



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?

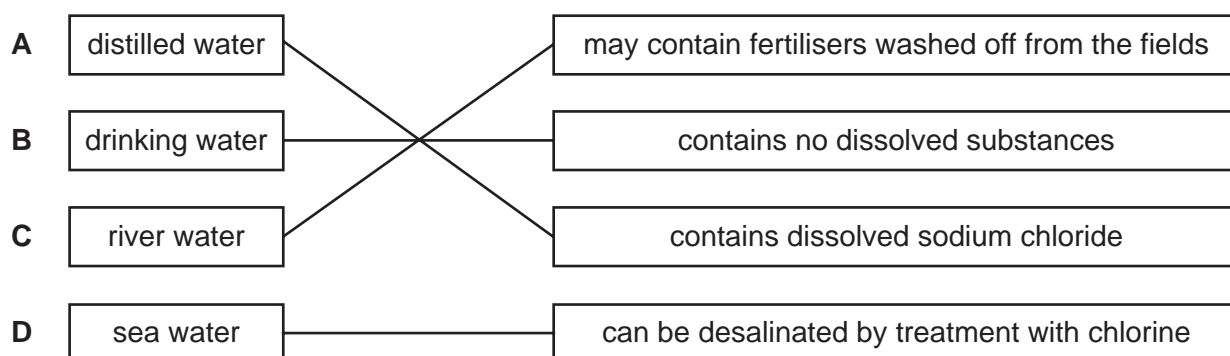
Aircraft bodies are made from

- 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?

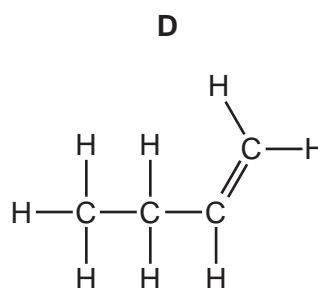
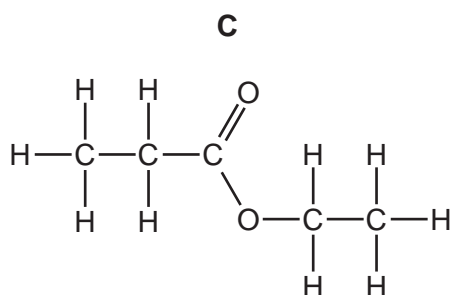
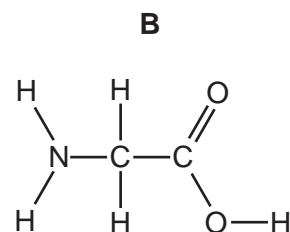
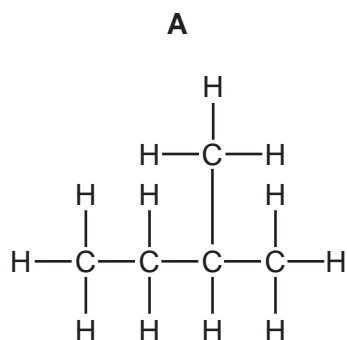


32 A catalytic converter in a car exhaust system speeds up the change of pollutants into less harmful products.

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?

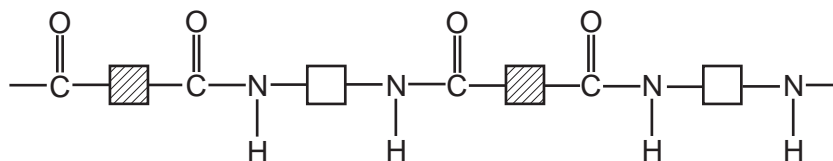
- A** It is an unsaturated compound.
- B** It is formed by the catalytic addition of steam to ethene.
- C** It is formed by the oxidation of ethanoic acid.
- D** It reacts with ethyl ethanoate to form an acid.

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?

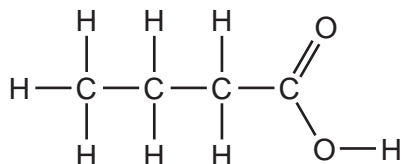
- A** manufacture of ethanol from ethene
- B** manufacture of margarine from vegetable oils
- C** manufacture of poly(ethene) from ethene
- D** manufacture of *Terylene* from a carboxylic acid and an alcohol

40 The results of tests on compound Z are shown.

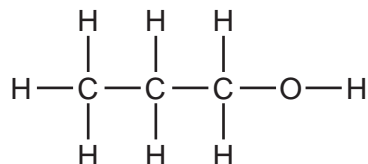
test	result
add bromine water	turns colourless
add aqueous sodium carbonate	carbon dioxide formed

What is compound Z?

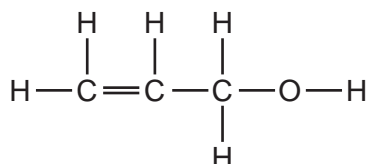
A



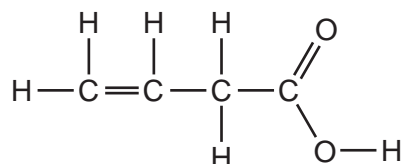
B



C



D



DATA SHEET
The Periodic Table of the Elements

I		II		Group										VII	0							
				III	IV	V	VI															
1	1										2	4										
H	H										He	He										
Hydrogen	Hydrogen										Helium	Helium										
7	9	23	24	39	40	45	48	51	52	55	56	59	59	64	65	70	73	75	79	80	84	131
Li	Be	Na	Mg	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	Xe
Lithium	Beryllium	Sodium	Magnesium	Potassium	Calcium	Scandium	Titanium	Vanadium	Chromium	Manganese	Iron	Cobalt	Nickel	Copper	Zinc	Gallium	Germanium	Arsenic	Selenium	Bromine	Krypton	Xenon
3	4	11	12	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	54
11	12	19	20	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	86
Na	Mg	Rb	Sr	K	Ca	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
Sodium	Magnesium	Rubidium	Strontium	Potassium	Calcium	Yttrium	Zirconium	Niobium	Molybdenum	Technetium	Ruthenium	Rhodium	Palladium	Silver	Cadmium	Indium	Tin	Antimony	Tellurium	Iodine	Xenon	
11	12	37	38	55	56	57	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	
23	24	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	
Fr	Ra	Rb	Sr	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
Francium	Radium	Rubidium	Strontium	Potassium	Calcium	Scandium	Titanium	Vanadium	Chromium	Manganese	Iron	Cobalt	Nickel	Copper	Zinc	Gallium	Germanium	Arsenic	Selenium	Bromine	Krypton	
87	88	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	
133	137	85	86	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	
Cs	Ba	Rb	Sr	K	Ca	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
Caesium	Barium	Rubidium	Strontium	Potassium	Calcium	Lanthanum	Hafnium	Tantalum	Tungsten	Rhenium	Osmium	Iridium	Platinum	Gold	Mercury	Thallium	Lead	Bismuth	Polonium	Astatine	Radon	
55	56	37	38	57	58	59	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	
226	227	227	227	227	227	227	227	227	227	227	227	227	227	227	227	227	227	227	227	227	227	
Fr	Ra	Rb	Sr	K	Ca	Ac	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
Francium	Radium	Rubidium	Strontium	Potassium	Calcium	Actinium	Hafnium	Tantalum	Tungsten	Rhenium	Osmium	Iridium	Platinum	Gold	Mercury	Thallium	Lead	Bismuth	Polonium	Astatine	Radon	
87	88	37	38	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	
175	173	167	169	165	162	159	157	152	150	144	141	140	137	133	127	127	127	127	127	127	127	
Lu	Yb	Er	Tm	Ho	Dy	Tb	Gd	Eu	Sm	Nd	Pr	Ce	La	Xe	Xe	Xe	Xe	Xe	Xe	Xe	Xe	
Lutetium	Ytterbium	Erbium	Thulium	Holmium	Dysprosium	Terbium	Gadolinium	Europlum	Samarium	Neodymium	Praseodymium	Cerium	Lanthanum	Xenon	Xenon	Xenon	Xenon	Xenon	Xenon	Xenon	Xenon	
71	70	68	69	67	66	65	64	63	62	60	59	58	57	54	54	54	54	54	54	54	54	
Lr	No	Fm	Md	Es	Cf	Bk	Cm	Am	Pu	U	Pa	Th	Ac	Ac	Ac	Ac	Ac	Ac	Ac	Ac	Ac	
Lawrencium	Nobelium	Fermium	Mendelevium	Einsteinium	Californium	Berkelium	Curium	Americium	Plutonium	Uranium	Protactinium	Thorium	Actinium	Actinium	Actinium	Actinium	Actinium	Actinium	Actinium	Actinium	Actinium	
103	102	100	101	99	98	97	96	95	94	92	91	90	89	89	89	89	89	89	89	89	89	

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

Key

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.).

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