



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

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CHEMISTRY

5070/12

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)

* 0 3 3 0 0 4 8 6 9 1 *

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?

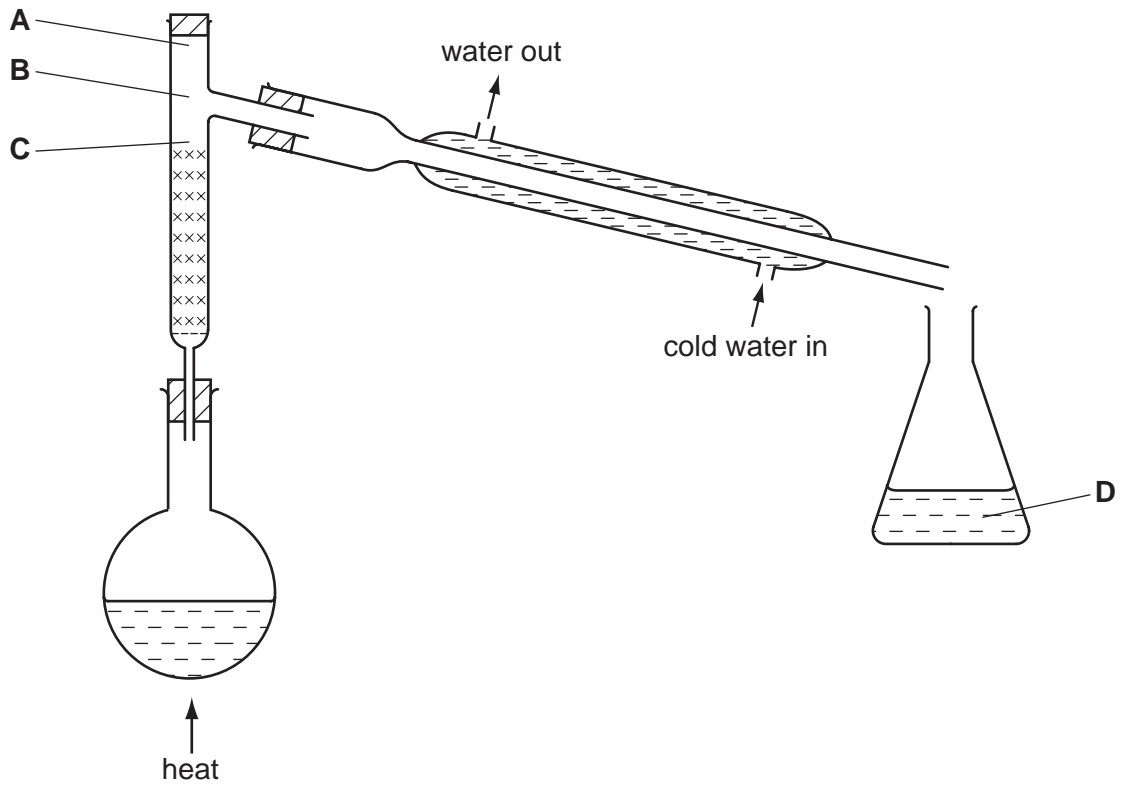
- A argon
 - B carbon dioxide
 - C nitrogen
 - D oxygen
- 2 Substance X dissolves in water to form a colourless solution. This solution reacts with aqueous lead(II) nitrate in the presence of dilute nitric acid to give a yellow precipitate.

What is substance X?

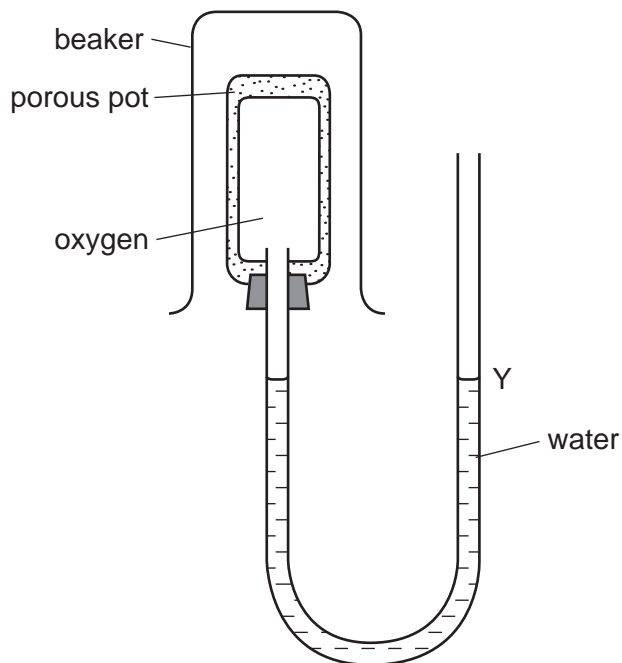
- A calcium iodide
- B copper(II) chloride
- C iron(II) iodide
- D sodium chloride

- 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?



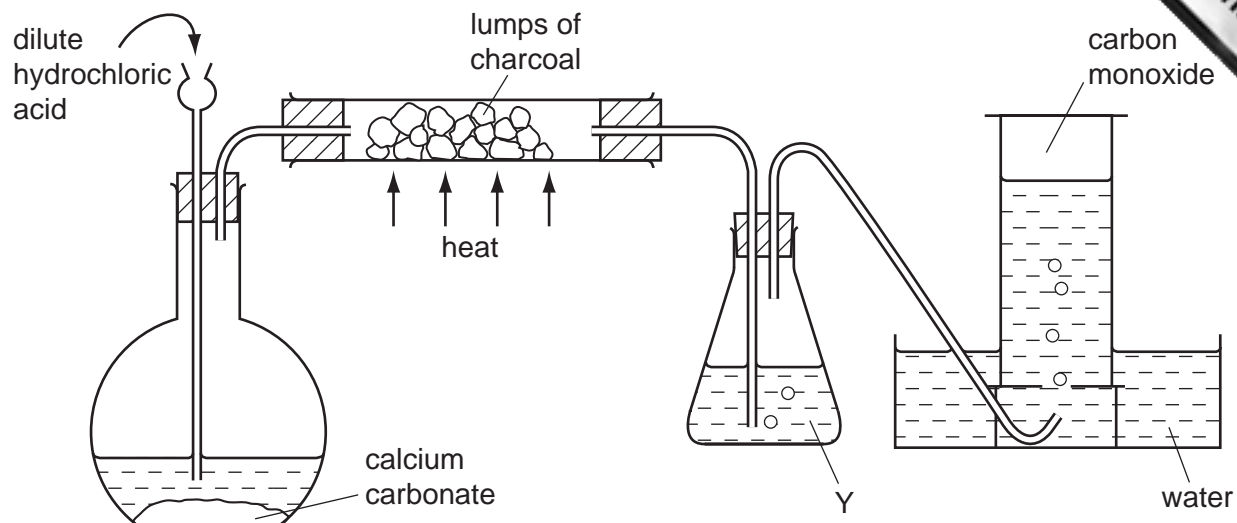
- 4 The diagram shows a diffusion experiment.



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

- A carbon dioxide, 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.

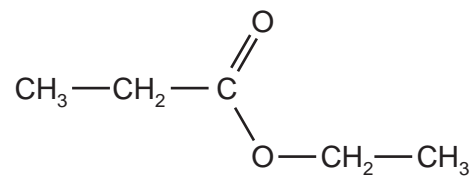
Oxygen combines with X to form a gaseous oxide.

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)

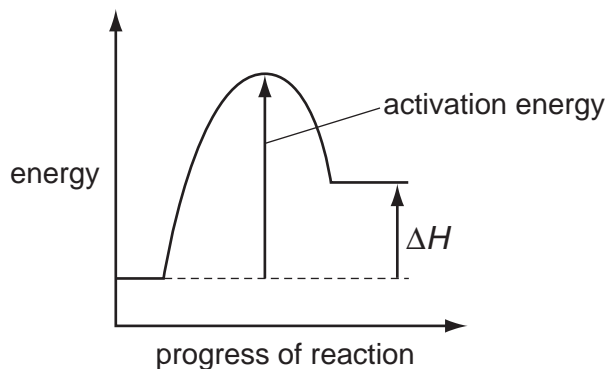
- 9 The diagram shows the molecule ethyl propanoate.



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

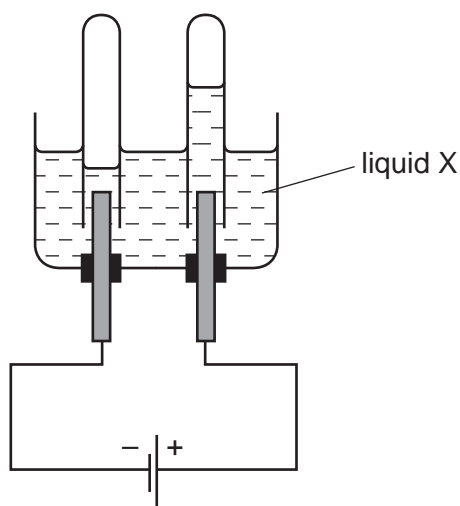
12 The energy profile for the forward direction of a **reversible** reaction is shown.



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.



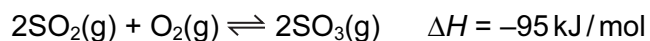
Which could be liquid X?

- 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?

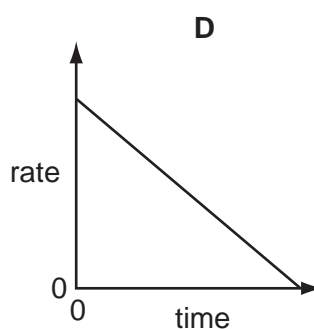
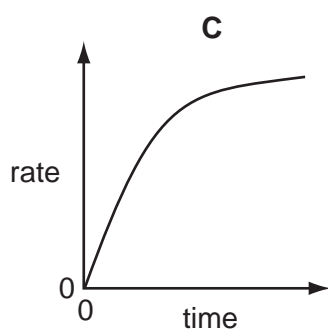
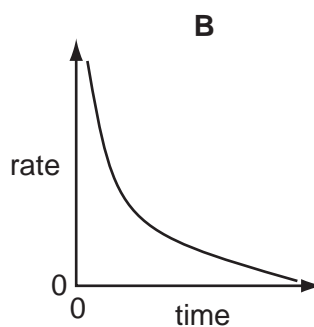
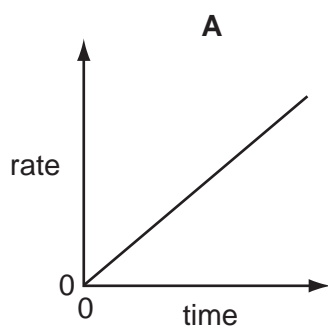
- A $\text{Cu} + 4\text{HNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + 2\text{H}_2\text{O} + 2\text{NO}_2$
- B $\text{CuO} + 2\text{HNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + \text{H}_2\text{O}$
- C $\text{Na}_2\text{CO}_3 + 2\text{HNO}_3 \rightarrow 2\text{NaNO}_3 + \text{H}_2\text{O} + \text{CO}_2$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

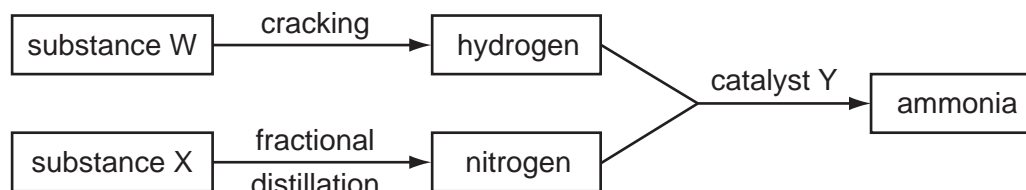
Which statement about this reaction is correct?

- 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

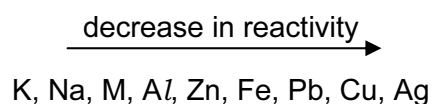
22 The diagram shows processes that take place in the manufacture of ammonia.



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.



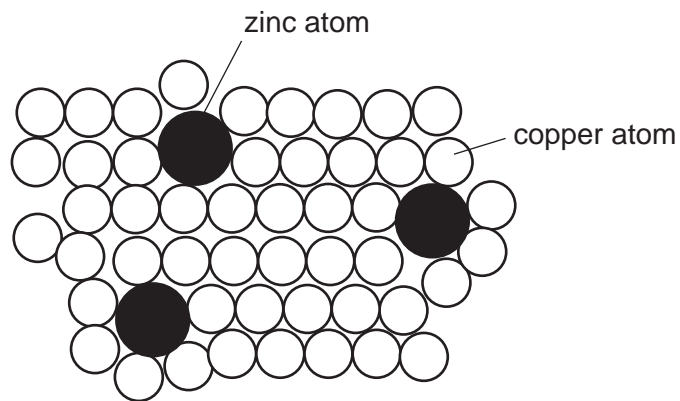
Which method will be used to extract M from its ore?

- 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?

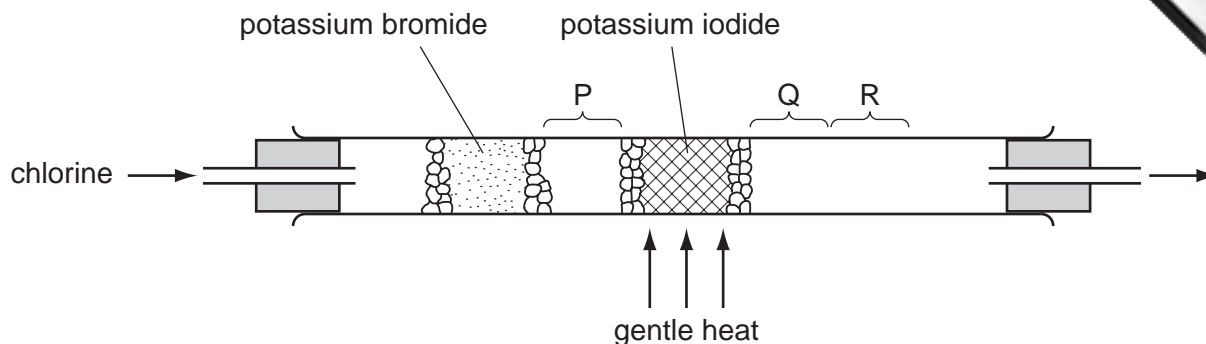
- A calcium
 - B copper
 - C magnesium
 - D potassium
- 25 The diagram shows the structure of brass.



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.

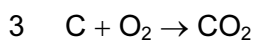
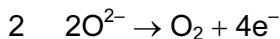
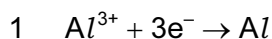


After a short time, coloured substances are seen at P, Q and R.

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

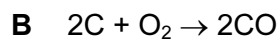
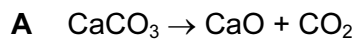
27 In the electrolysis of molten aluminium oxide for the extraction of aluminium, the following three reactions take place.



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?

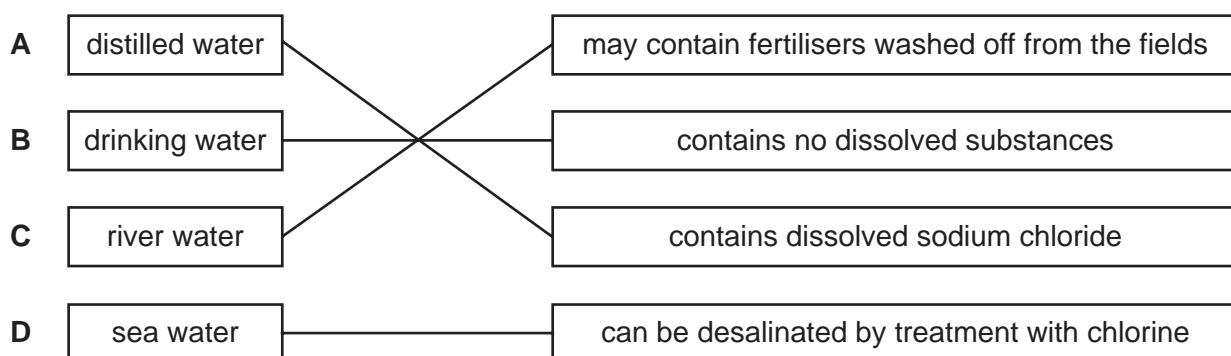
Aircraft bodies are made from

- 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?

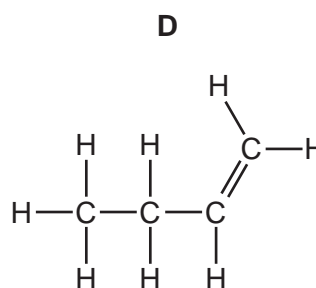
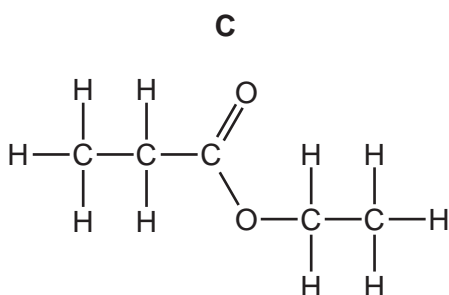
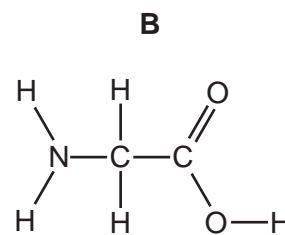
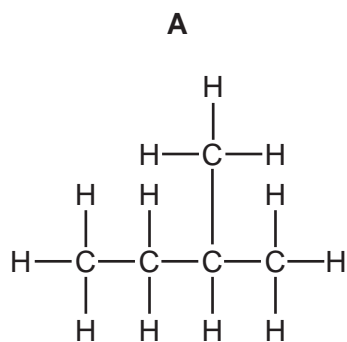


32 A catalytic converter in a car exhaust system speeds up the change of pollutants into less harmful products.

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?

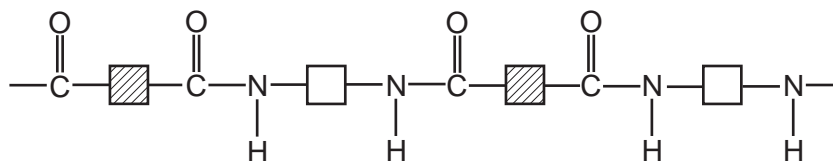
- A** It is an unsaturated compound.
- B** It is formed by the catalytic addition of steam to ethene.
- C** It is formed by the oxidation of ethanoic acid.
- D** It reacts with ethyl ethanoate to form an acid.

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?

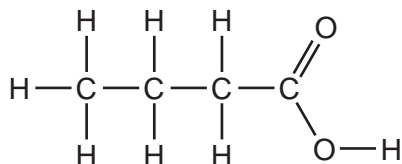
- A** manufacture of ethanol from ethene
- B** manufacture of margarine from vegetable oils
- C** manufacture of poly(ethene) from ethene
- D** manufacture of *Terylene* from a carboxylic acid and an alcohol

40 The results of tests on compound Z are shown.

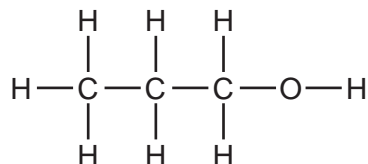
test	result
add bromine water	turns colourless
add aqueous sodium carbonate	carbon dioxide formed

What is compound Z?

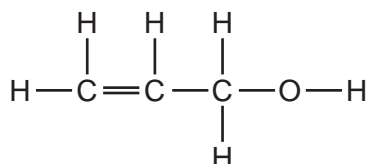
A



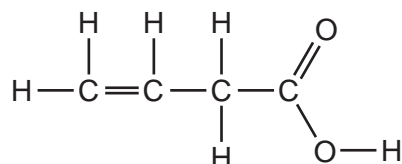
B



C



D



DATA SHEET
The Periodic Table of the Elements

Group		III	IV	V	VI	VII	0																																							
I	II	<table border="1"> <tr> <td>11 B Boron 5</td> <td>12 C Carbon 6</td> <td>13 Al Aluminium 13</td> <td>14 Si Silicon 14</td> <td>15 P Phosphorus 15</td> <td>16 S Sulfur 16</td> <td>17 Cl Chlorine 17</td> <td>18 Ar Argon 18</td> </tr> <tr> <td>27 Co Cobalt 27</td> <td>28 Ni Nickel 28</td> <td>29 Cu Copper 29</td> <td>30 Zn Zinc 30</td> <td>31 Ga Gallium 31</td> <td>32 Ge Germanium 32</td> <td>33 As Arsenic 33</td> <td>34 Se Selenium 34</td> </tr> <tr> <td>41 Nb Niobium 41</td> <td>42 Mo Molybdenum 42</td> <td>43 Tc Technetium 43</td> <td>44 Ru Ruthenium 44</td> <td>45 Rh Rhodium 45</td> <td>46 Pd Palladium 46</td> <td>47 Ag Silver 47</td> <td>48 Cd Cadmium 48</td> </tr> <tr> <td>73 Ta Tantalum 73</td> <td>74 W Tungsten 74</td> <td>75 Re Rhenium 75</td> <td>76 Os Osmium 76</td> <td>77 Ir Iridium 77</td> <td>78 Pt Platinum 78</td> <td>79 Au Gold 79</td> <td>80 Hg Mercury 80</td> </tr> <tr> <td>81 Tl Thallium 81</td> <td>82 Pb Lead 82</td> <td>83 Bi Bismuth 83</td> <td>84 Po Polonium 84</td> <td>85 At Astatine 85</td> <td>86 Rn Radon 86</td> <td colspan="2"></td> </tr> </table>					11 B Boron 5	12 C Carbon 6	13 Al Aluminium 13	14 Si Silicon 14	15 P Phosphorus 15	16 S Sulfur 16	17 Cl Chlorine 17	18 Ar Argon 18	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	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	73 Ta Tantalum 73	74 W Tungsten 74	75 Re Rhenium 75	76 Os Osmium 76	77 Ir Iridium 77	78 Pt Platinum 78	79 Au Gold 79	80 Hg Mercury 80	81 Tl Thallium 81	82 Pb Lead 82	83 Bi Bismuth 83	84 Po Polonium 84	85 At Astatine 85	86 Rn Radon 86		
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 19 **F** Fluorine 9 | 20 **Ne** Neon 10 || 7 **Li** Lithium 3 | 9 **Be** Beryllium 4 | | | | | | | | | |--------------------------------|--|--|--|--|--|--| | 1
H
Hydrogen
1 | | | | | | | |--------------------------------|--|--|--|--|--|--| | | | | | 4 **He** Helium 2 |
| 23 **Na** Sodium 11 | 24 **Mg** Magnesium 12 | | | | | | | | | | |---------------------------------------|--|--|--|--|---------------------------------------|---------------------------------------|---------------------------------------| | 55
Mn
Manganese
25 | 56
Fe
Iron
26 | 57
Co
Cobalt
27 | 58
Ni
Nickel
28 | 59
Cu
Copper
29 | 60
Zn
Zinc
30 | 61
Ga
Gallium
31 | 62
Ge
Germanium
32 | | 91
Zr
Zirconium
40 | 92
Nb
Niobium
41 | 93
Mo
Molybdenum
42 | 94
Tc
Technetium
43 | 95
Ru
Ruthenium
44 | 96
Rh
Rhodium
45 | 97
Pd
Palladium
46 | 98
Ag
Silver
47 | | 137
Ba
Barium
56 | 138
La
Lanthanum
57 | 139
Ce
Cerium
58 | 140
Pr
Praseodymium
59 | 141
Nd
Neodymium
60 | 142
Pm
Promethium
61 | 143
Sm
Samarium
62 | 144
Eu
Europium
63 | | 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 | | 103
Bi
Bismuth
103 | 104
Po
Polonium
104 | 105
At
Astatine
105 | 106
Rn
Radon
106 | 107
Fr
Francium
107 | 108
Ra
Radium
108 | 109
Ac
Actinium
109 | 110
Th
Thorium
110 | | 167
Er
Erbium
68 | 168
Tm
Thulium
69 | 169
Yb
Ytterbium
70 | 170
Lu
Lutetium
71 | 171
Hf
Hafnium
72 | 172
Ta
Tantalum
73 | 173
W
Tungsten
74 | 174
Re
Rhenium
75 | | 165
Ho
Holmium
67 | 166
Er
Erbium
68 | 167
Tm
Thulium
69 | 168
Yb
Ytterbium
70 | 169
Lu
Lutetium
71 | 170
Hf
Hafnium
72 | 171
Ta
Tantalum
73 | 172
Re
Rhenium
75 | | 159
Tb
Terbium
65 | 160
Dy
Dysprosium
66 | 161
Ho
Holmium
67 | 162
Er
Erbium
68 | 163
Tm
Thulium
69 | 164
Yb
Ytterbium
70 | 165
Lu
Lutetium
71 | 166
Hf
Hafnium
72 | | 140
Ce
Cerium
58 | 141
Pr
Praseodymium
59 | 142
Nd
Neodymium
60 | 143
Pm
Promethium
61 | 144
Sm
Samarium
62 | 145
Eu
Europium
63 | 146
Gd
Gadolinium
64 | 147
Tb
Terbium
65 | | 232
Th
Thorium
90 | 238
U
Uranium
92 | 239
Np
Neptunium
93 | 240
Pu
Plutonium
94 | 241
Am
Americium
95 | 242
Cm
Curium
96 | 243
Bk
Berkelium
97 | 244
Cf
Californium
98 | | 140
Ce
Cerium
58 | 141
Pr
Praseodymium
59 | 142
Nd
Neodymium
60 | 143
Pm
Promethium
61 | 144
Sm
Samarium
62 | 145
Eu
Europium
63 | 146
Gd
Gadolinium
64 | 147
Tb
Terbium
65 | | 150
Sm
Samarium
62 | 151
Eu
Europium
63 | 152
Gd
Gadolinium
64 | 153
Tb
Terbium
65 | 154
Dy
Dysprosium
66 | 155
Ho
Holmium
67 | 156
Er
Erbium
68 | 157
Tm
Thulium
69 | | 175
Lu
Lutetium
71 | 176
Yb
Ytterbium
70 | 177
Lu
Lutetium
71 | 178
Yb
Ytterbium
70 | 179
Lu
Lutetium
71 | 180
Yb
Ytterbium
70 | 181
Lu
Lutetium
71 | 182
Yb
Ytterbium
70 | | 103
Lr
Lawrencium
103 | 104
No
Nobelium
102 | 105
Uu
Ununpentium
105 | 106
Uu
Ununhexium
106 | 107
Uu
Ununseptium
107 | 108
Uu
Ununoctium
108 | 109
Uu
Ununnonium
109 | 110
Uu
Unundecium
110 | | | | | |

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

a	X
Key	

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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