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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

**CHEMISTRY** **5070/01**

Paper 1 Multiple Choice **May/June 2008**

**1 hour**

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

*6681210173*

**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 **15** printed pages and **1** blank page.

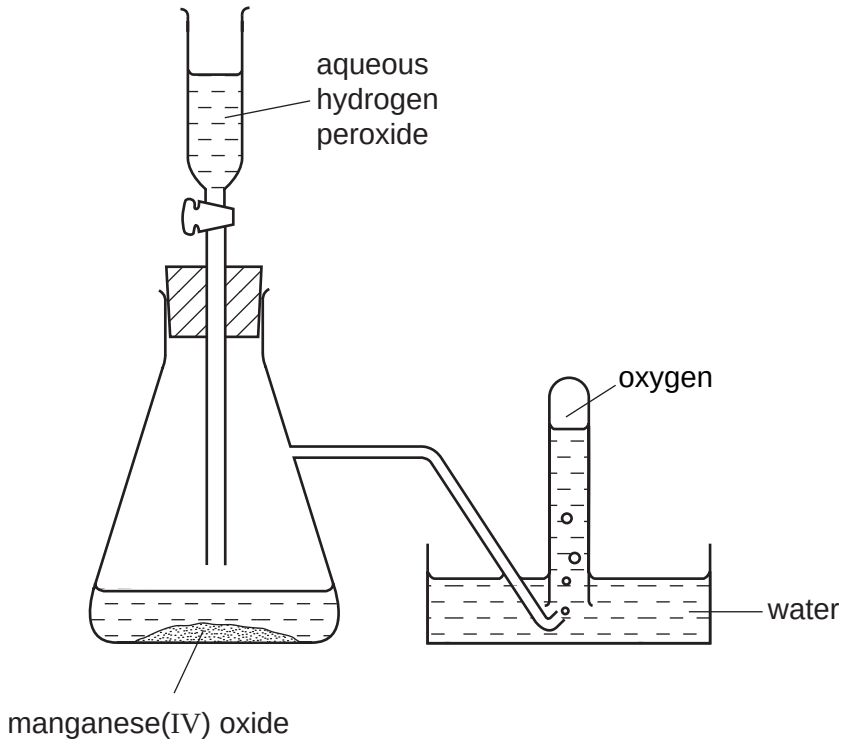

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**1** Oxygen was prepared from hydrogen peroxide and collected as shown in the diagram.

$$2H_2O_2 \rightarrow 2H_2O + O_2$$




The first few tubes of gas were rejected because the gas was contaminated by

**A** water vapour.

**B** hydrogen peroxide.

**C** hydrogen.

**D** nitrogen.

**2** The table gives the properties of four substances.

Which substance is a solid metal at room temperature?

| | melting point / °C | boiling point / °C | electrical conductivity when solid | electrical conductivity when molten |
|---|---|---|---|---|
| **A** | 808 | 1465 | ✗ | ✓ |
| **B** | 98 | 890 | ✓ | ✓ |
| **C** | 119 | 445 | ✗ | ✗ |
| **D** | –39 | 357 | ✓ | ✓ |

key

✓ = conducts

✗ = does not conduct

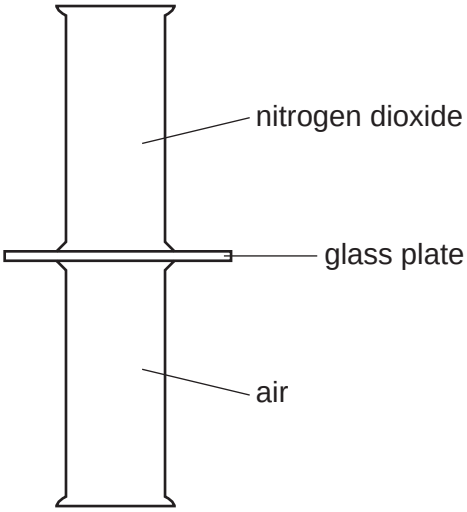
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**3** Nitrogen dioxide is a dark brown gas and is more dense than air.

A gas jar containing nitrogen dioxide is sealed with a glass plate and is then inverted on top of a gas jar containing air.




The glass plate is removed.

Which one of the following correctly describes the colours inside the gas jars after a long period of time?

| | upper gas jar | lower gas jar |
|---|---|---|
| **A** | brown | brown |
| **B** | dark brown | light brown |
| **C** | colourless | dark brown |
| **D** | light brown | dark brown |

**4** A student tested a solution by adding aqueous sodium hydroxide. A precipitate was **not** seen because the reagent was added too quickly.

What could **not** have been present in the solution?

**A** $Al^{3+}$ **B** $Ca^{2+}$ **C** $NH_4^+$ **D** $Zn^{2+}$

**5** Which substance has a giant molecular structure at room temperature?

**A** methane

**B** sand

**C** sodium chloride

**D** water

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**6** When a covalent liquid boils its molecules become more widely spaced.

Which property of the molecules has the most influence on the energy required to boil a covalent liquid?

**A** the forces of attraction between the molecules

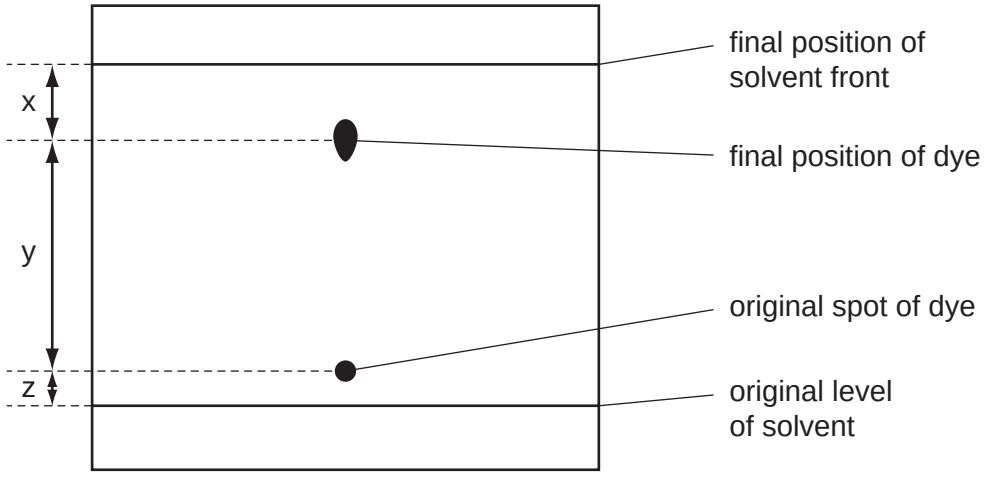
**B** the reactivity of the molecules

**C** the shape of the molecules

**D** the strength of the covalent bonds in the molecules

**7** The diagram shows the chromatogram obtained by analysis of a single dye.

Three measurements are shown.




How is the $R_f$ value of the dye calculated?

**A** $\frac{x}{x+y}$ **B** $\frac{y}{x+y}$ **C** $\frac{x}{x+y+z}$ **D** $\frac{y}{x+y+z}$

**8** The atoms $^{64}_{29}Cu$ and $^{65}_{30}Zn$ have the same

**A** nucleon number.

**B** number of electrons.

**C** number of neutrons.

**D** proton number.

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**9** Why does molten sodium chloride conduct electricity?

**A** An electron is completely transferred from sodium to chlorine.

**B** Sodium ions are only weakly attracted to the chloride ions.

**C** The electrons in the sodium chloride are free to move.

**D** The sodium ions and the chloride ions are free to move.

**10** Which equation describes the most suitable reaction for making lead sulphate?

**A** $Pb + H_2SO_4 \rightarrow PbSO_4 + H_2$

**B** $PbCO_3 + H_2SO_4 \rightarrow PbSO_4 + CO_2 + H_2O$

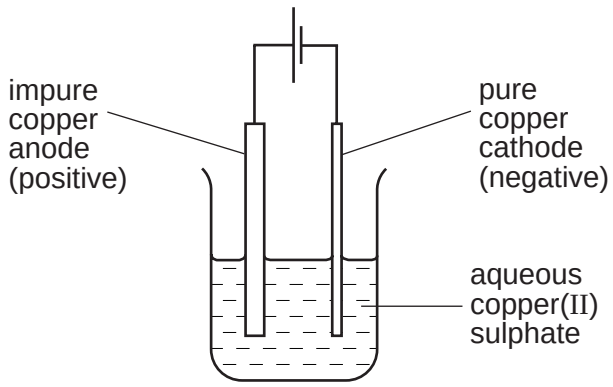
**C** $Pb(NO_3)_2 + H_2SO_4 \rightarrow PbSO_4 + 2HNO_3$

**D** $Pb(OH)_2 + H_2SO_4 \rightarrow PbSO_4 + 2H_2O$

**11** In which oxide does *X* have the same oxidation state as in the chloride, $XCl_3$?

**A** $X_3O$ **B** $X_2O$ **C** $XO_2$ **D** $X_2O_3$

**12** A sample of copper contains a metal impurity which is below copper in the reactivity series. The diagram shows the apparatus used for refining the sample.




The loss in mass of the anode (positive electrode) is 50 g and the gain in mass of the cathode (negative electrode) is 45 g.

What is the percentage purity of this sample of copper?

**A** 10.0 % **B** 11.1 % **C** 90.0 % **D** 95.0 %

**13** One mole of a sample of hydrated sodium sulphide contains 162 g of water of crystallisation.

What is the correct formula of this compound?

**A** $Na_2S.3H_2O$ **B** $Na_2S.5H_2O$ **C** $Na_2S.7H_2O$ **D** $Na_2S.9H_2O$

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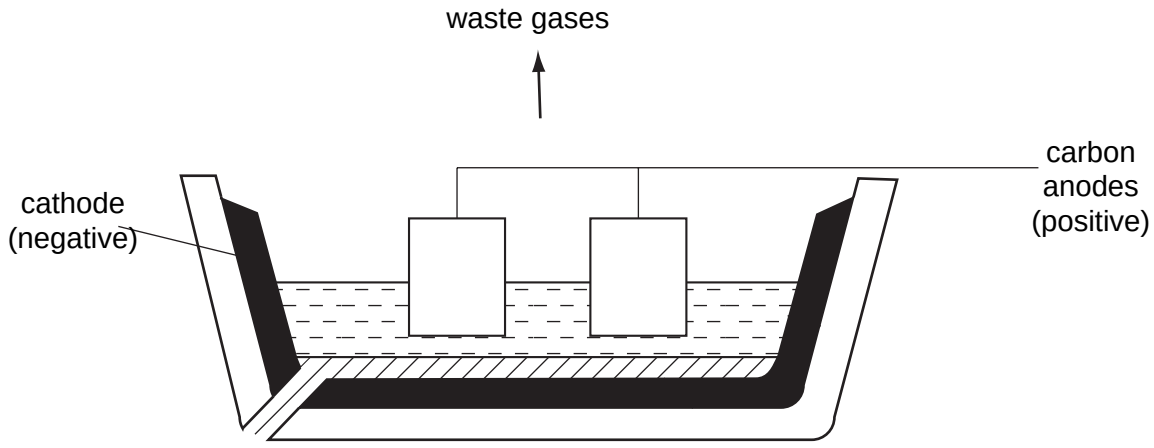


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**14** The diagram shows the electrolytic production of aluminium.




What are the products at the electrodes?

| | negative electrode | positive electrode |
|---|---|---|
| **A** | solid aluminium | hydrogen |
| **B** | solid aluminium | oxygen |
| **C** | liquid aluminium | hydrogen |
| **D** | liquid aluminium | oxygen |

**15** When dilute sulphuric acid is electrolysed between platinum electrodes, which statements are correct?

1 Hydrogen is released at the cathode.

2 Oxygen is released at the anode.

3 Sulphur is released at the anode.

4 The acid becomes more dilute.

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

**16** Which of the following is an endothermic reaction?

**A** the combustion of ethanol in air

**B** the formation of a carbohydrate and oxygen from carbon dioxide and water

**C** the oxidation of carbon to carbon dioxide

**D** the reaction between hydrogen and oxygen

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**17** At 400 °C the reaction between hydrogen and iodine reaches an equilibrium.

$$H_2(g) + I_2(g) \rightleftharpoons 2HI(g) \qquad \Delta H = -13\,kJ$$

Which change in conditions would increase the percentage of hydrogen iodide in the equilibrium mixture?

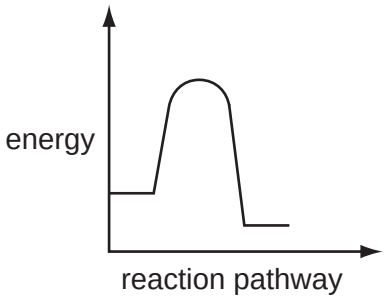
**A** a decrease in pressure

**B** a decrease in temperature

**C** an increase in pressure

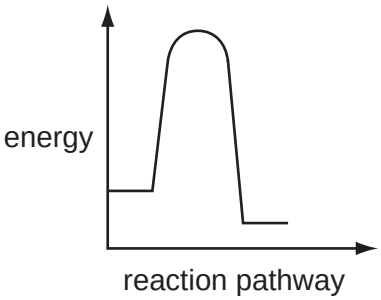
**D** an increase in temperature

**18** The diagram shows the reaction pathway for a reaction without a catalyst.

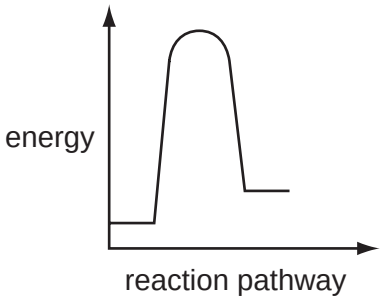



Which diagram shows the addition of a catalyst which speeds up the reaction?

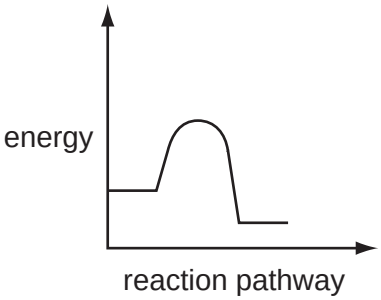
**A**



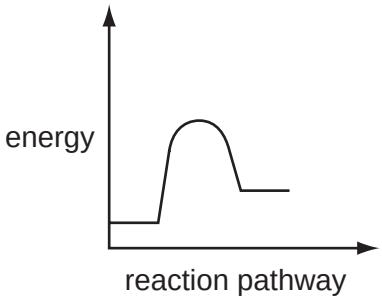

**B**




**C**




**D**




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**19** Sulphur dioxide reacts with aqueous bromine according to the following equation.

$$SO_2(g) + Br_2(aq) + 2H_2O(l) \rightarrow H_2SO_4(aq) + 2HBr(aq)$$

Which element has been oxidised?

**A** bromine

**B** hydrogen

**C** oxygen

**D** sulphur

**20** When 20 $cm^3$ of a 2 $mol/dm^3$ solution of potassium hydroxide is mixed with 20 $cm^3$ of a 1 $mol/dm^3$ solution of sulphuric acid, the temperature of the mixture rises.

What best explains this?

**A** Sulphuric acid is a strong acid.

**B** The potassium hydroxide solution is more concentrated than the sulphuric acid solution.

**C** The reactants have a higher energy content than the products.

**D** Potassium hydroxide is a very strong alkali.

**21** A colourless gas is passed into each of three different solutions. The results for each solution are shown in the table.

| solution | result |
|---|---|
| potassium iodide | stays colourless |
| acidified potassium dichromate(VI) | orange to green |
| acidified potassium manganate(VII) | purple to colourless |

What is the colourless gas?

**A** an acid

**B** an alkali

**C** an oxidising agent

**D** a reducing agent

**22** Which observation is typical of a solid non-metal element?

**A** It reacts vigorously with chlorine.

**B** It conducts electricity.

**C** It has more than one oxidation state.

**D** It forms an acidic oxide.

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**23** Which equation represents the reaction between hydrochloric acid and sodium hydroxide?

**A** $Cl^- + Na^+ \rightarrow NaCl$

**B** $2H^+ + O^{2-} \rightarrow H_2O$

**C** $\frac{1}{2}O_2 + H_2 \rightarrow H_2O$

**D** $H^+ + OH^- \rightarrow H_2O$

**24** The following statements about dilute sulphuric acid are all correct.

1 A white precipitate is formed when aqueous barium chloride is added.

2 The solution turns anhydrous copper(II) sulphate from white to blue.

3 Addition of Universal Indicator shows that the solution has a pH value of less than 7.0.

4 The solution reacts with copper(II) oxide, forming a blue solution.

Which two statements confirm the acidic nature of the solution?

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

**25** Ammonia gas is produced when solid ammonium chloride is heated with

**A** calcium hydroxide.

**B** calcium sulphate.

**C** hydrochloric acid.

**D** magnesium nitrate.

**26** Sulphur and selenium (Se) are in the same group of the Periodic Table.

From this, we would expect selenium to form compounds having the formulae

**A** SeO, $Na_2Se$ and $NaSeO_4$.

**B** $SeO_2$, $Na_2Se$ and $NaSeO_4$.

**C** $SeO_2$, $Na_2Se$ and $Na_2SeO_4$.

**D** $SeO_3$, NaSe and $NaSeO_4$.

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**27** X and Y are diatomic elements. X is less reactive than Y.

What are elements X and Y?

| | X | Y |
|---|---|---|
| **A** | chlorine | iodine |
| **B** | fluorine | nitrogen |
| **C** | iodine | bromine |
| **D** | oxygen | nitrogen |

**28** A metal *X*, in Group I of the Periodic Table, would be expected to

**A** form a nitrate of formula $X(NO_3)_2$.

**B** form an acidic oxide.

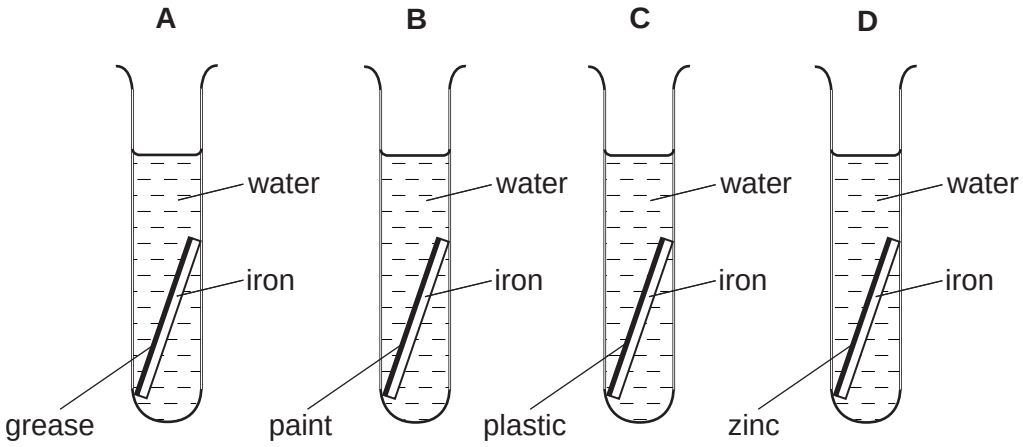
**C** form an insoluble chloride.

**D** produce hydrogen from cold water.

**29** Four test-tubes were set up as shown.

Each piece of iron was protected on one side by a different coating.

In which test-tube is the iron **least** likely to rust?




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**30** Three types of steel have different properties.

steel 1 easily shaped

steel 2 brittle

steel 3 resistant to corrosion

What are the names of these three types of steel?

| | steel 1 | steel 2 | steel 3 |
|---|---|---|---|
| **A** | high carbon | mild | stainless |
| **B** | high carbon | stainless | mild |
| **C** | mild | high carbon | stainless |
| **D** | mild | stainless | high carbon |

**31** Aluminium is used to make saucepans because of its apparent lack of reactivity.

Which property of aluminium explains its unreactivity?

**A** It has a high electrical conductivity.

**B** It has a low density.

**C** It has a surface layer of oxide.

**D** It is in Group III of the Periodic Table.

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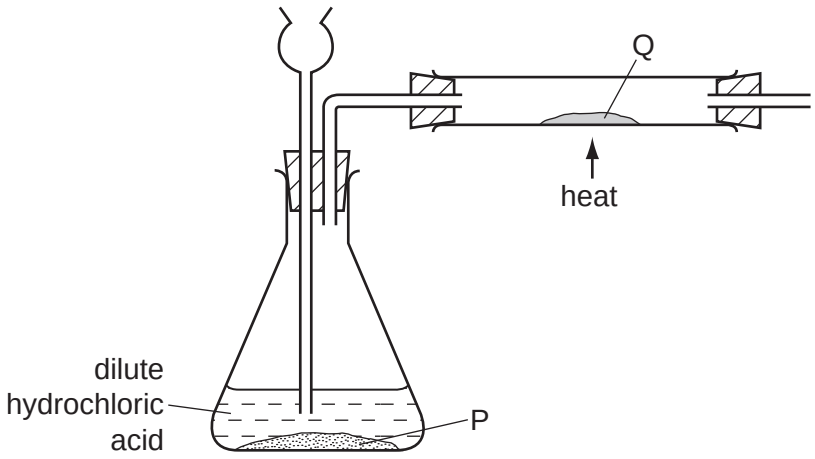


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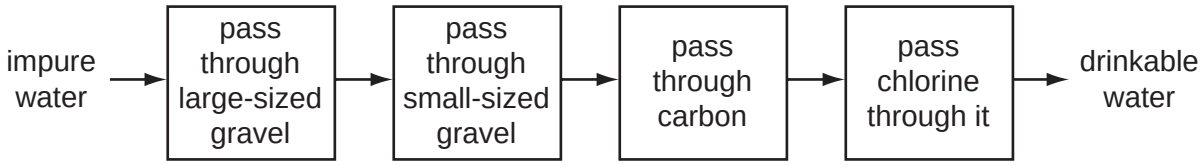
**32** The diagram shows the apparatus used in an experiment to reduce substance Q with the gas generated in the flask.




What are substances P and Q?

| | P | Q |
|---|---|---|
| **A** | copper | copper(II) oxide |
| **B** | lead | lead(II) oxide |
| **C** | magnesium | zinc oxide |
| **D** | zinc | copper(II) oxide |

**33** The flow chart shows how impure water can be treated to produce drinkable water.




What is **not** removed from the water by this process?

**A** clay particles

**B** microbes

**C** nitrates

**D** odours

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**34** A solid substance Z burns in air to form a product that is gaseous at 20 °C.

What is Z?

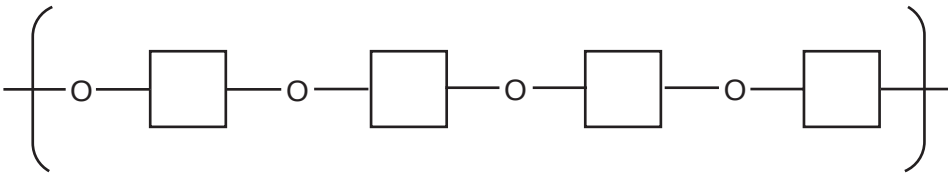
**A** hydrogen

**B** carbon monoxide

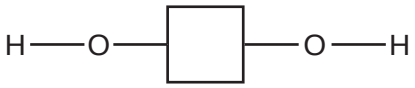
**C** carbon

**D** magnesium

**35** A section of a polymer is shown.



The structure of its monomer is



The monomer undergoes condensation polymerisation to form the polymer.

What is made each time a monomer adds to the polymer?

**A** hydrogen molecules, $H_2$

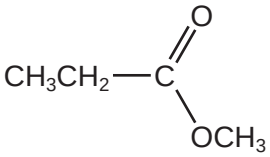
**B** hydroxide ions, $OH^-$

**C** oxygen atoms, O

**D** water molecules, $H_2O$

**36** Carboxylic acids react with alcohols to form esters.

Which acid and alcohol react together to form the following ester?



**A** propanoic acid and ethanol

**B** propanoic acid and methanol

**C** ethanoic acid and ethanol

**D** ethanoic acid and methanol

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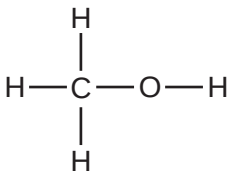
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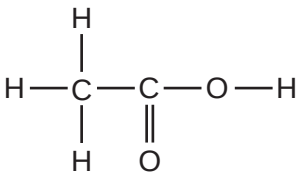


**37** Which two compounds are members of the same homologous series?

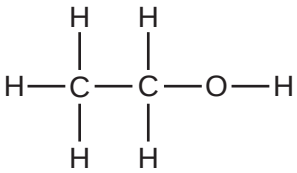
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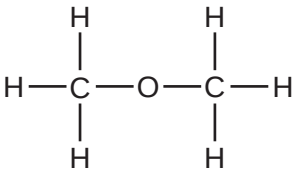
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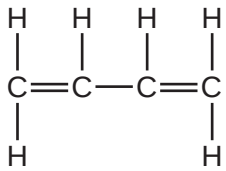


4



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

**38** The diagram shows the structure of the compound 1,3-butadiene.



How many molecules of hydrogen are needed to saturate one molecule of 1,3-butadiene?

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

**39** Which compound has more than two carbon atoms per molecule?

**A** ethyl ethanoate

**B** ethene

**C** ethane

**D** ethanoic acid

**40** Alkanes are a homologous series of organic compounds.

Which statement about alkanes is correct?

**A** Their boiling points increase as the length of the carbon chain increases.

**B** Their general formula is $C_nH_{2n}$.

**C** They are unsaturated hydrocarbons.

**D** They take part in addition reactions.

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

| Group | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | II | | | | | | | | | | III | IV | V | VI | VII | 0 |
| | | | | | | | | | | | | | | | | 4 He Helium 2 |
| | | | | | 1 H Hydrogen 1 | | | | | | | | | | | |
| 7 Li Lithium 3 | 9 Be Beryllium 4 | | | | | | | | | | 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 Sulphur 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 | 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 | Tc Technetium 43 | 101 Ru Ruthenium 44 | 103 Rh Rhodium 45 | 106 Pd Palladium 46 | 108 Ag Silver 47 | 112 Cd Cadmium 48 | 115 In Indium 49 | 122 Sb Antimony 51 | 128 Te Tellurium 52 | 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 | 186 Re Rhenium 75 | 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 | Po Polonium 84 | At Astatine 85 | Rn Radon 86 |
| Fr Francium 87 | 226 Ra Radium 88 | 227 Ac Actinium 89 † | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 140 Ce Cerium 58 | 141 Pr Praseodymium 59 | 144 Nd Neodymium 60 | 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 | Pa Protactinium 91 | 238 U Uranium 92 | Np Neptunium 93 | Pu Plutonium 94 | Am Americium 95 | Cm Curium 96 | Bk Berkelium 97 | Cf Californium 98 | Es Einsteinium 99 | Fm Fermium 100 | Md Mendelevium 101 | No Nobelium 102 | Lr Lawrencium 103 |

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

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

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

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