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)

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.

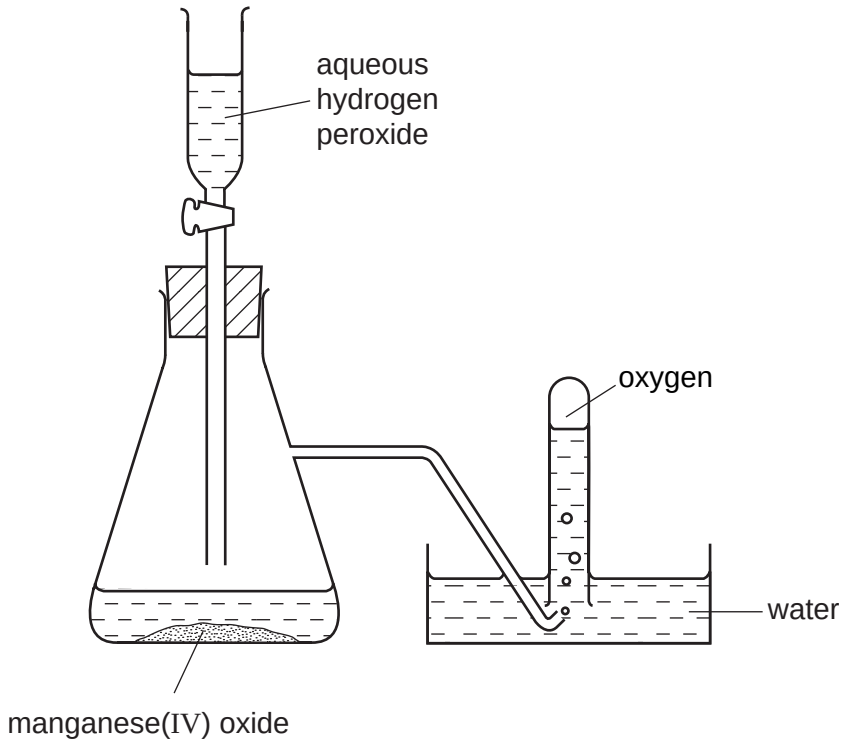
Read the instructions on the Answer Sheet very carefully.

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.

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	✓	✓

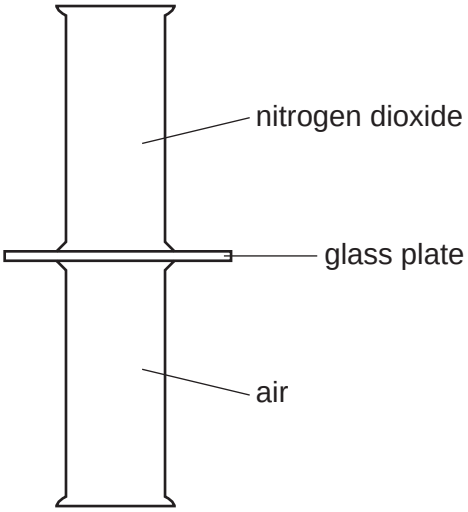
key

✓ = conducts

✗ = does not conduct

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

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

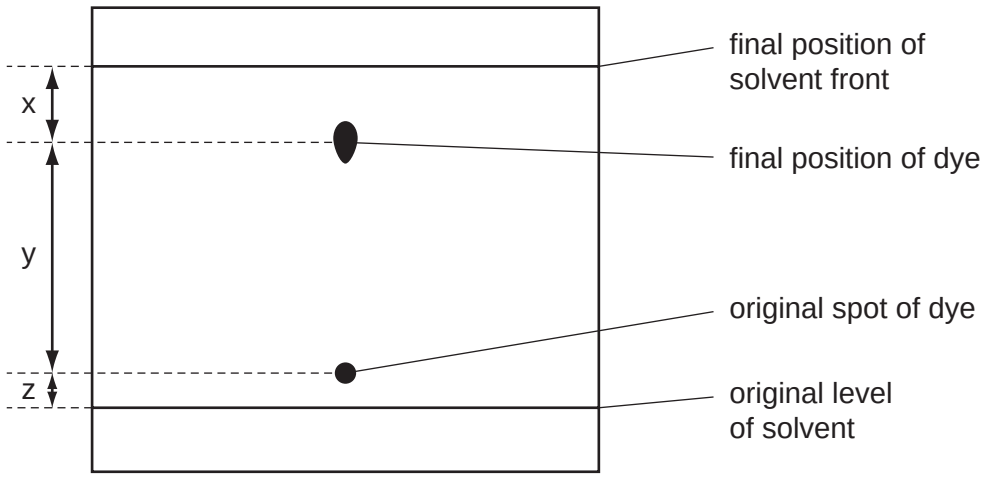
B the reactivity of the molecules

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.

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

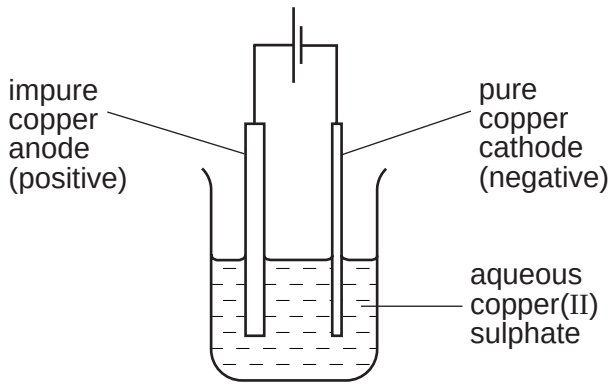
C $Pb(NO_3)_2 + H_2SO_4 \rightarrow PbSO_4 + 2HNO_3$

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?

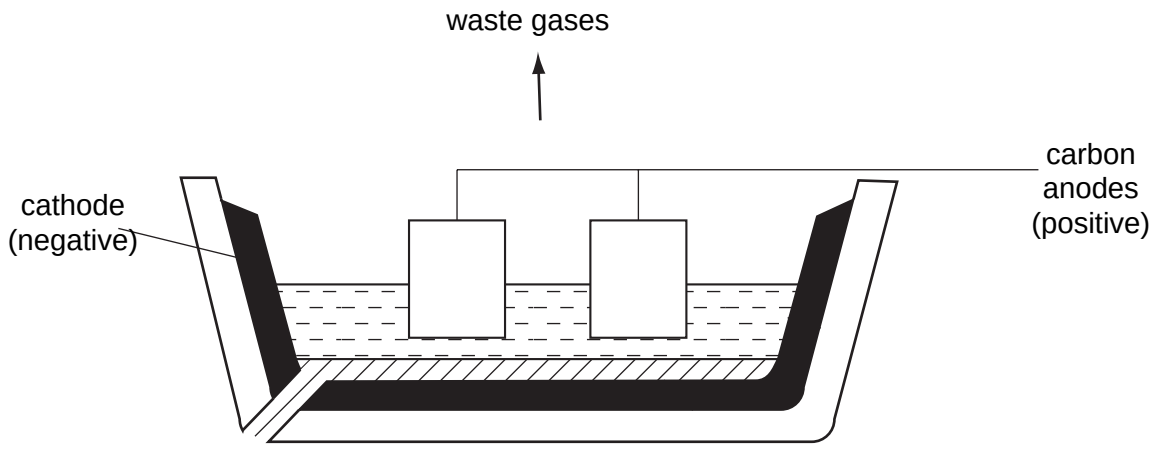
A 10.0 % **B** 11.1 % **C** 90.0 % **D** 95.0 %

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** $Na_2S.9H_2O$

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

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?

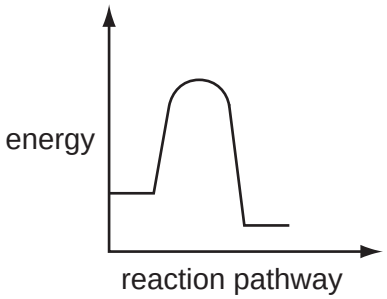
A a decrease in pressure

B a decrease in temperature

C an increase in pressure

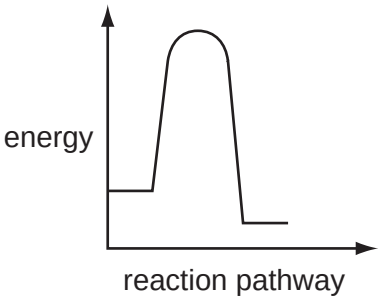
D an increase in temperature

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

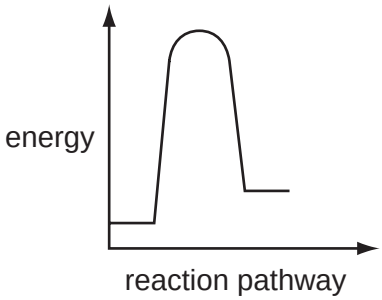


Which diagram shows the addition of a catalyst which speeds up the reaction?

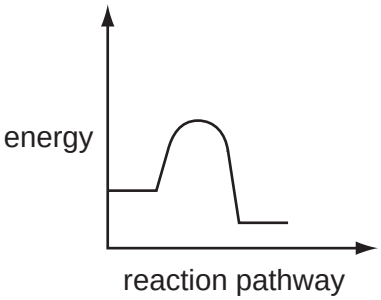
A



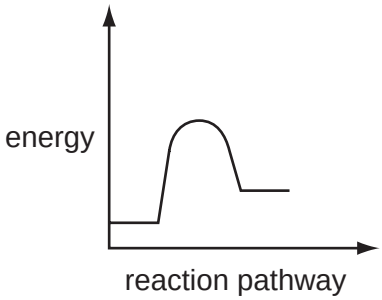
B



C



D



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.

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 $NaSeO_4$.

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.

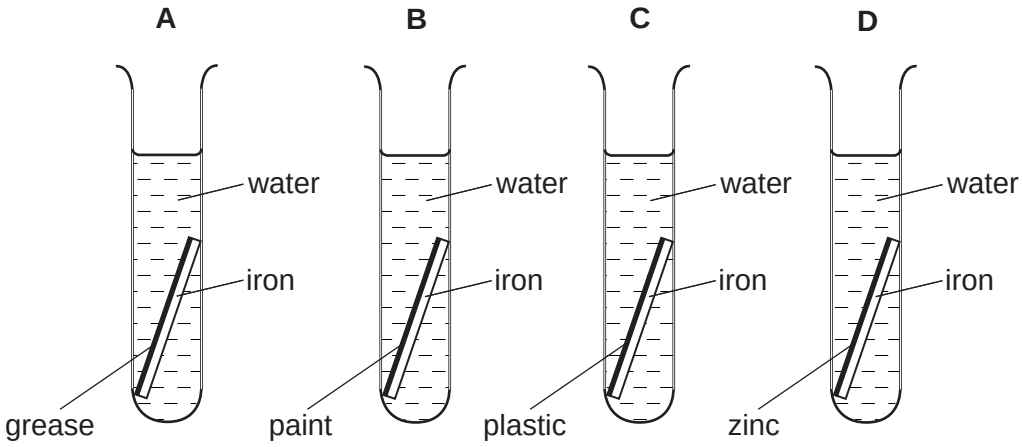
C form an insoluble chloride.

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?



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.

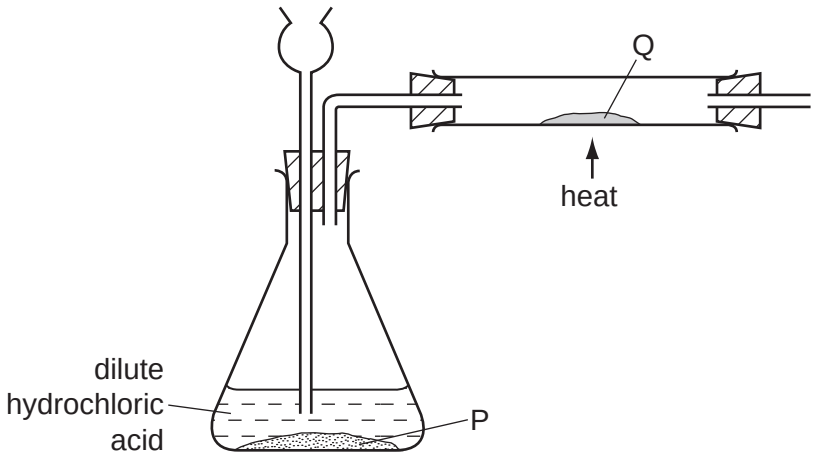
B It has a low density.

C It has a surface layer of oxide.

D It is in Group III of the Periodic Table.

[Turn over

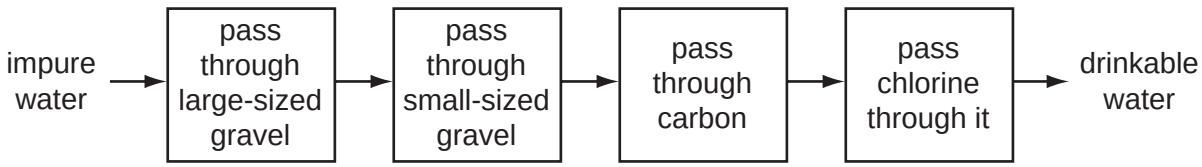
32 The diagram shows the apparatus used in an experiment to reduce substance Q with the gas generated in the flask.



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

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

What is Z?

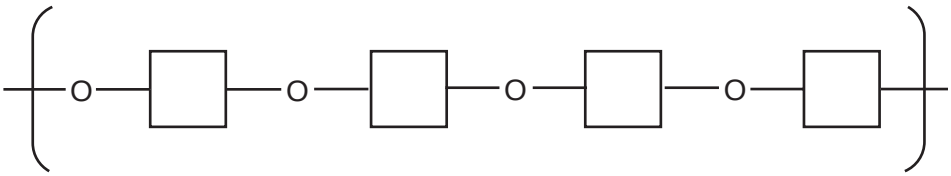
A hydrogen

B carbon monoxide

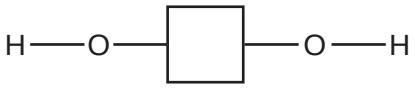
C carbon

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

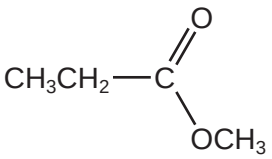
B hydroxide ions, OH

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

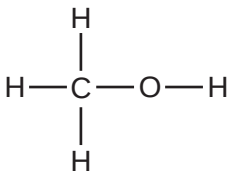
C ethanoic acid and ethanol

D ethanoic acid and methanol

[Turn over

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

1



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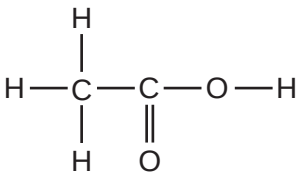

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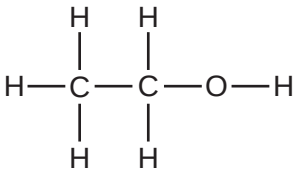

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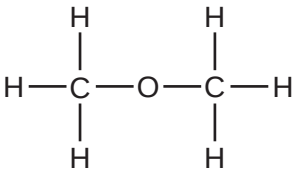
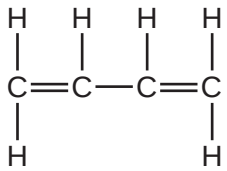


A 1 and 2 **B** 1 and 3 **C** 1 and 4 **D** 2 and 4

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	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	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	119 Sn Tin 50	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	a = relative atomic mass
X	X = atomic symbol
b	b = proton (atomic) number

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