UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CHEMISTRY **0620/01**

Paper 1 Multiple Choice

October/November 2004

45 minutes

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.
You may use a calculator.

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

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International Examinations

[Turn over

1 When steam at 100 °C condenses to water at 25 °C, what happens to the water molecules?

A They move faster and closer together.

B They move faster and further apart.

C They move slower and closer together.

D They move slower and further apart.

2 The melting points and boiling points of four substances are shown.

Which substance is liquid at 100 °C?

substance	melting point / °C	boiling point / °C
A	–203	–17
B	–25	50
C	11	181
D	463	972

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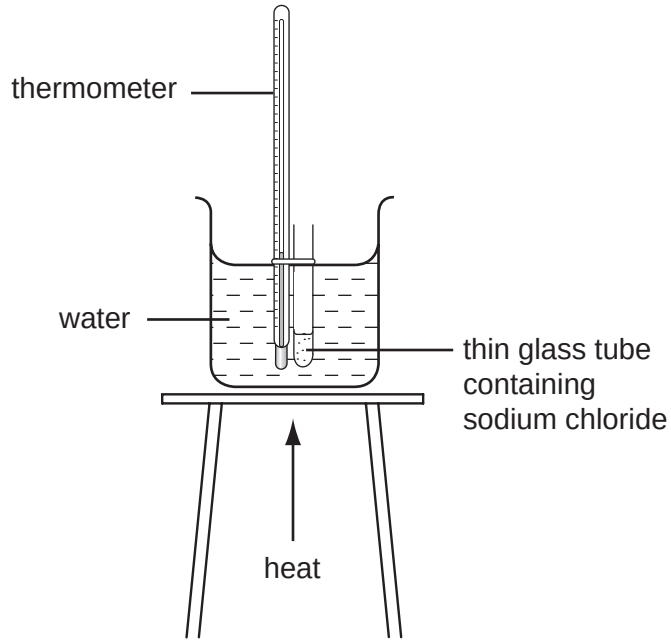
3 The apparatus shown **cannot** be used to determine the melting point of sodium chloride, Na^+Cl^-.



Why is this?

	melting point of sodium chloride is greater than 100 °C	sodium chloride dissolves in the water
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

4 A student wishes to extract a coloured solution from some berries to make an indicator solution.

Which of the listed instructions should the student follow?

1	crush the berries
2	add acid
3	add a solvent
4	filter the mixture
5	distil the filtrate

A 1, 2 and 4

B 1, 3 and 4

C 2, 3 and 5

D 2, 4 and 5

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5 Hydrogen and helium have isotopes, as shown.

In which of these isotopes does the nucleus have twice as many neutrons as protons?

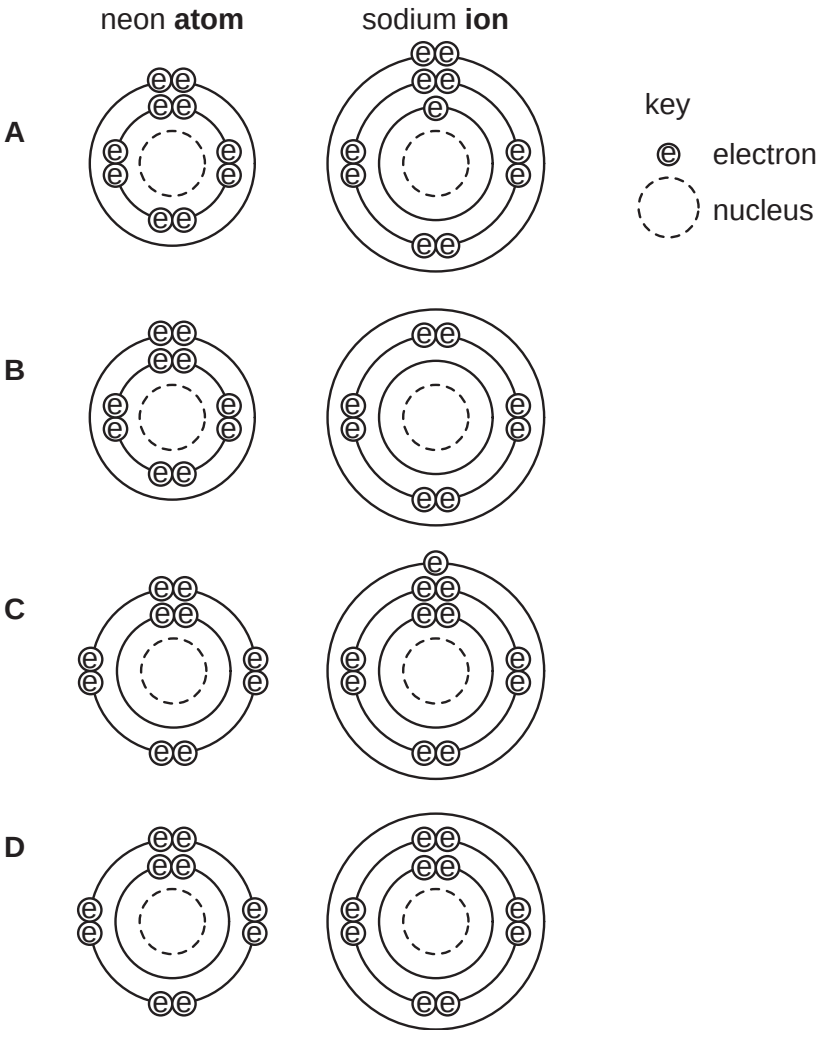
A $^{2}_{1}H$

B $^{3}_{1}H$

C $^{3}_{2}He$

D $^{4}_{2}He$

6 How are the electrons arranged in a neon **atom**, Ne, and a sodium **ion**, Na^{+}?



7 Which compound has ionic bonds?

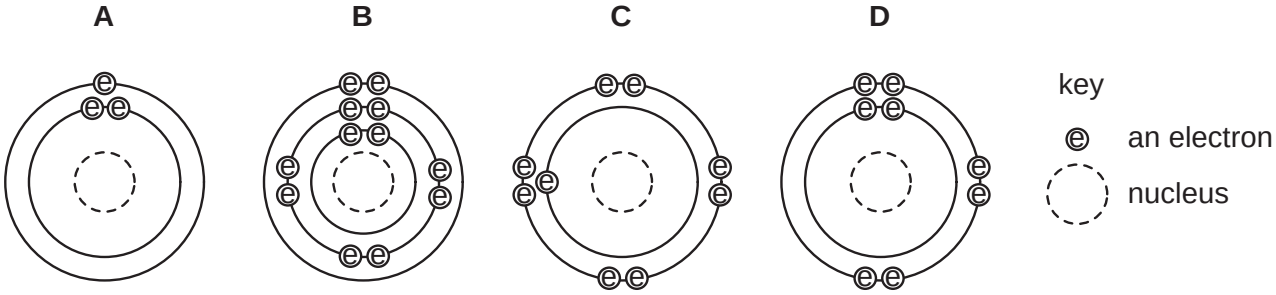
A hydrogen chloride

B methane

C sodium chloride

D water

8 Which diagram shows an atom in the same group of the Periodic Table as sodium?



9 When propane is burned, carbon dioxide and water are formed, as shown.

$$C_3H_8 + 5O_2 \rightarrow rCO_2 + sH_2O$$

Which values of *r* and *s* balance the equation?

	r	*s*
A	1	3
B	1	5
C	3	4
D	3	8

10 Which formula represents a compound containing three atoms?

A HNO_3 **B** H_2O **C** LiF **D** $ZnSO_4$

11 A substance **X** is heated in an evaporating basin until there is no further change.

	mass of basin and contents
before heating	25.52 g
after heating	26.63 g

What could **X** be?

A copper

B copper(II) carbonate

C copper(II) oxide

D hydrated copper(II) sulphate

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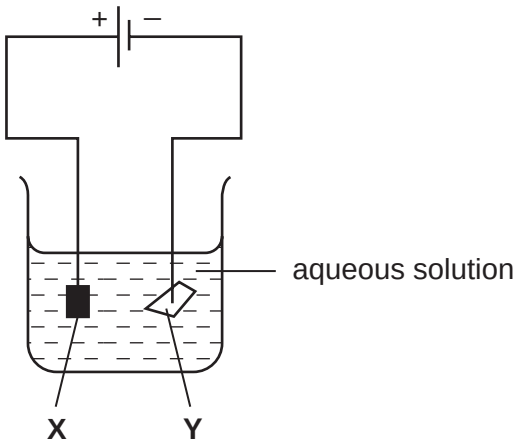
12 Aluminium is extracted from its oxide by electrolysis.

Which words correctly complete the spaces?

The oxide is dissolved in ……1…… cryolite and aluminium is deposited at the ……2……

	space 1	space 2
A	aqueous	negative cathode
B	aqueous	positive anode
C	molten	negative cathode
D	molten	positive anode

13 The diagram shows an electrolysis experiment using metals **X** and **Y** as electrodes.



One of the metals becomes coated with copper.

Which metal becomes coated and which aqueous solution is used?

	metal	aqueous solution
A	**X**	$CrCl_3$
B	**X**	$CuCl_2$
C	**Y**	$CrCl_3$
D	**Y**	$CuCl_2$

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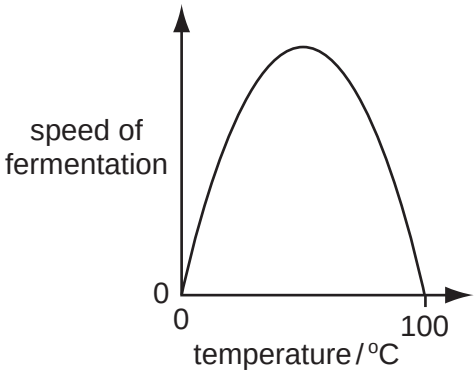
14 The solvent ethanol is produced by the fermentation of sugar, using yeast.

Which graph correctly shows how the speed of fermentation changes with temperature?

A



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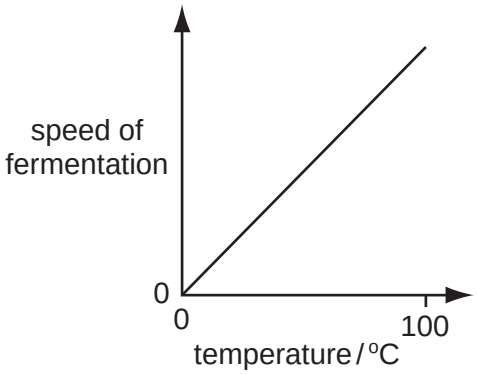

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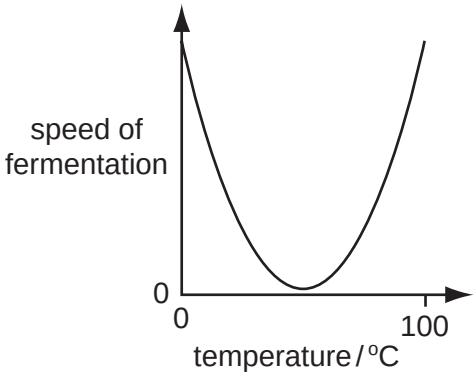
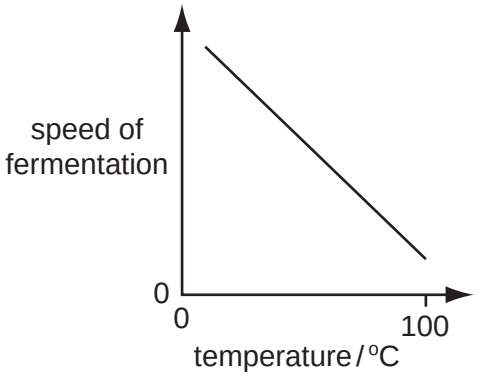


D



15 In which process does an endothermic change take place?

A combustion

B evaporation

C filtration

D neutralisation

16 The sign $\rightleftharpoons$ is used in some equations to show that a reaction can be reversed.

Two incomplete equations are given.

	reagents	products
P	$CoCl_2 + 2H_2O$	$CoCl_2.\ 2H_2O$
Q	$C + O_2$	CO_2

For which of these reactions can a $\rightleftharpoons$ sign be correctly used to complete the equation?

	P	Q
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

17 In which reaction does reduction of the underlined substance take place?

A $\underline{Cu_2O} + C \rightarrow 2Cu + CO$

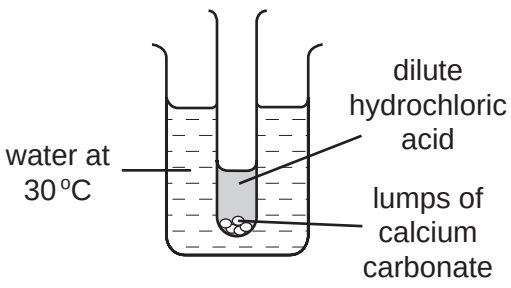
B $\underline{2Cu_2O} + O_2 \rightarrow 4CuO$

C $\underline{2Cu} + O_2 \rightarrow 2CuO$

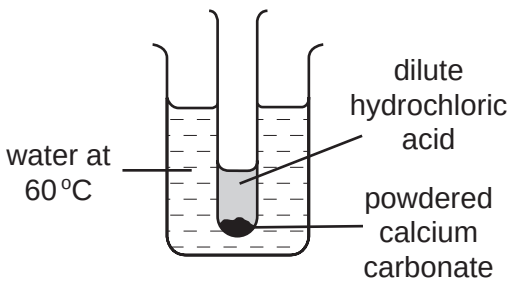
D $CuO + \underline{CO} \rightarrow Cu + CO_2$

18 In which experiment is the rate of reaction between hydrochloric acid and calcium carbonate **slowest**?

A



B



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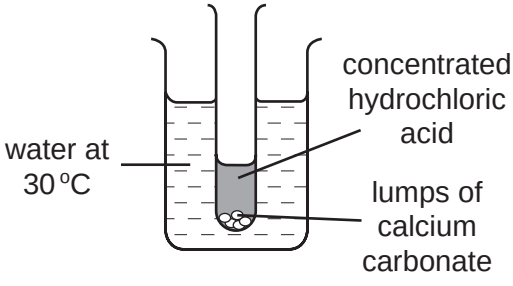

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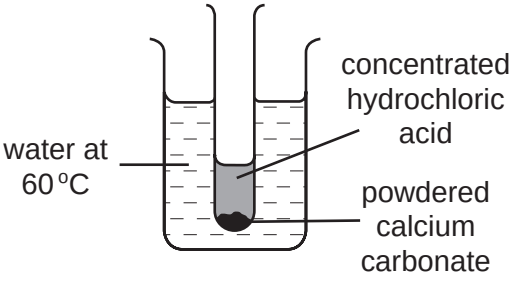

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19 Aqueous ammonia is added to a solution of a metal sulphate.

A green precipitate that is insoluble in excess of the aqueous ammonia forms.

Which metal ion is present?

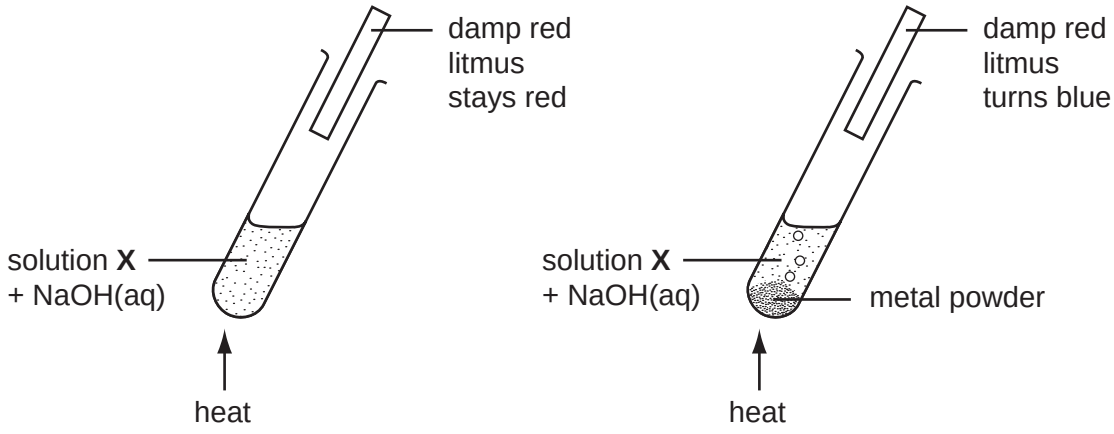
A Ca^{2+} **B** Cu^{2+} **C** Fe^{3+} **D** Fe^{2+}

20 The chart shows the colour ranges of four different indicators.

Which indicator is blue in an acidic solution?

indicator	pH value: 1 2 3 4 5 6 7 8 9 10 11 12 13 14
A	yellow → ← blue
B	red → blue ← yellow
C	red → ← blue
D	colourless → ← blue

21 An ion **X** in solution is identified as shown.



What is ion **X**?

A $Al^{3+}(aq)$ **B** $NH_4^+(aq)$ **C** $NO_3^-(aq)$ **D** $SO_4^{2-}(aq)$

22 Metals can be joined together by welding them at a high temperature.

Why is an argon atmosphere often used?

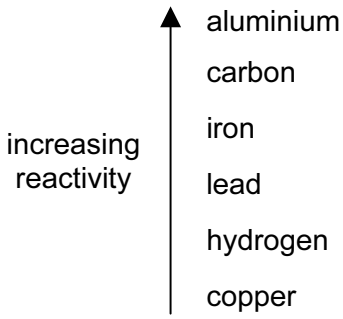
A Argon has a low density.

B Argon is colourless.

C Argon is inexpensive.

D Argon is unreactive.

23 Part of the reactivity series is outlined below.



Electrolysis is an expensive way of extraction.

Which metal has to be extracted from its ore by electrolysis?

A aluminium

B copper

C lead

D iron

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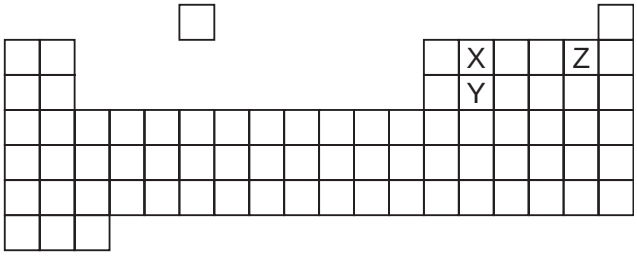
24 The diagram shows part of the Periodic Table.



Which statement about elements X, Y and Z is correct?

The proton number of X is

A seven less than that of Z.

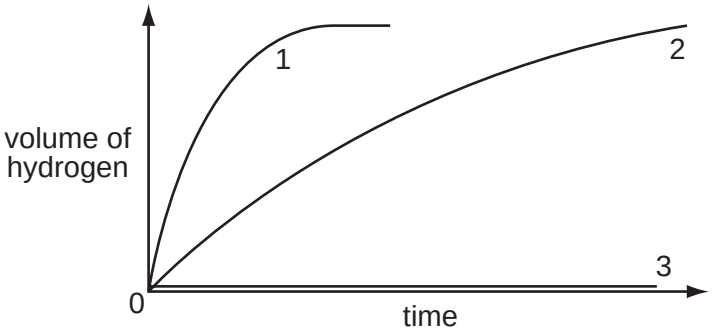
B three less than that of Z.

C one less than that of Y.

D sixteen less than that of Y.

25 Three different metals, Cu, Fe and Mg, are each added to an excess of dilute hydrochloric acid.

The graph shows how rapidly hydrogen is given off.



Which metal gives which curve?

	1	2	3
A	Fe	Cu	Mg
B	Fe	Mg	Cu
C	Mg	Cu	Fe
D	Mg	Fe	Cu

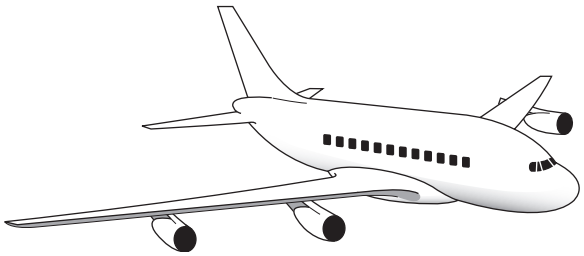
26 Which substance is a metal?

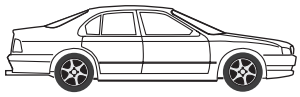
	electrical conductivity (solid)	electrical conductivity (molten)
A	high	high
B	high	low
C	low	high
D	low	low

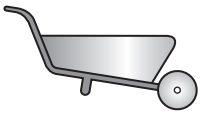
27 Which changes occur when impure iron is made into stainless steel?

	carbon	chromium
A	added	added
B	added	removed
C	removed	added
D	removed	removed

28 The bodies of an aeroplane, a car and a wheelbarrow are made of metal.







Which metal is used for which body?

	aeroplane	car	wheelbarrow
A	aluminium	iron	steel
B	aluminium	steel	iron
C	steel	aluminium	iron
D	steel	iron	aluminium

29 What is used to test for the presence of water?

A anhydrous copper(II) sulphate

B aqueous barium chloride

C aqueous sodium hydroxide

D Universal indicator paper

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30 A candle is burned in a fixed volume of air.

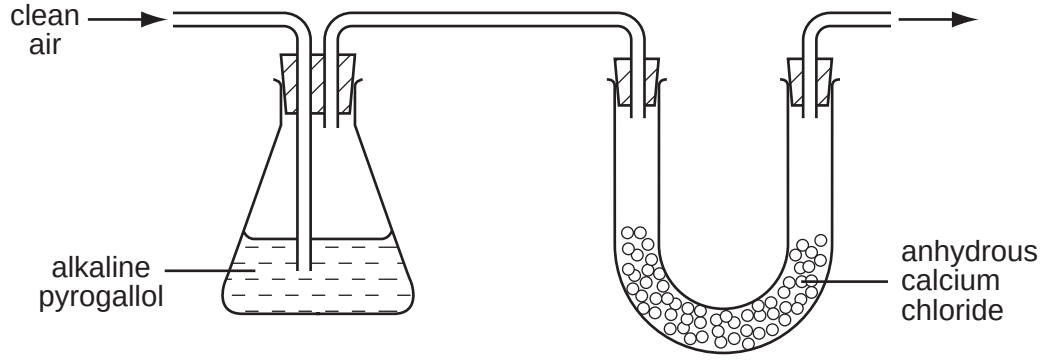
How do the percentages (%) of carbon dioxide and oxygen change?

	carbon dioxide	oxygen
A	fall	fall
B	fall	rise
C	rise	fall
D	rise	rise

31 Anhydrous calcium chloride is used as a drying agent.

An alkaline solution of pyrogallol absorbs oxygen and carbon dioxide.

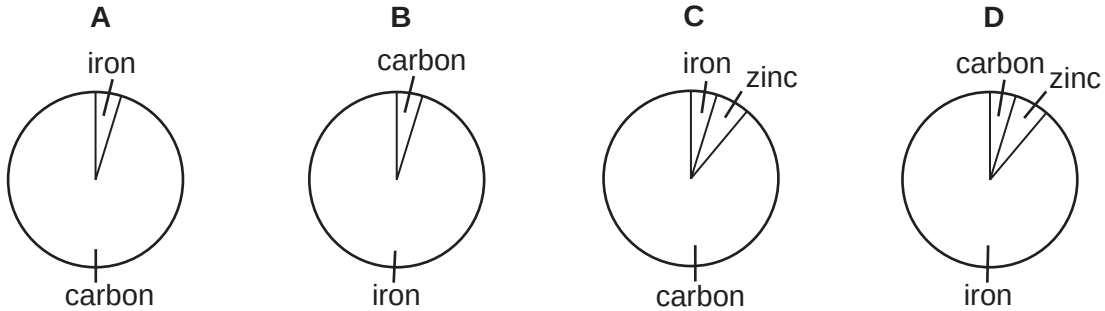
Clean air is passed through the apparatus shown.



Which gases are present in the air leaving the apparatus?

	argon	nitrogen	hydrogen
A	✓	✓	✓
B	✓	✗	✓
C	✗	✓	✓
D	✓	✓	✗

32 Which chart could represent the composition of a galvanised roof?



33 Which statement explains why iron is used as the catalyst in the manufacture of ammonia?

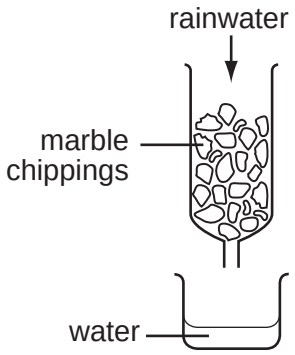
A More ammonia is produced in a given time.

B The catalyst is unchanged at the end of the reaction.

C The catalyst neutralises the ammonia.

D The purity of the ammonia is improved.

34 A sample of acid rainwater (pH = 4) is passed down a glass column packed with marble chippings (calcium carbonate). The water coming from the bottom of the column is collected in a beaker. The pH is now 6.



What causes the change in pH?

A The acid has been filtered.

B The acid has been neutralised.

C The acid is made more concentrated.

D The acid is precipitated.

35 What are the products when limestone (calcium carbonate) is strongly heated?

A calcium hydroxide and carbon dioxide

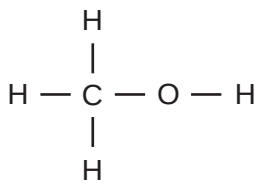
B calcium hydroxide and carbon monoxide

C calcium oxide and carbon dioxide

D calcium oxide and carbon monoxide

36 Which compound is ethanol?

A



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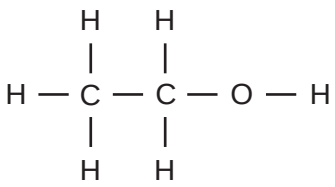
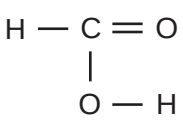


C



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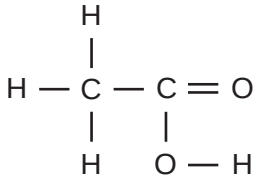

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37 What is petroleum?

A an aircraft fuel

B a central heating fuel

C a mixture of carbohydrates

D a mixture of hydrocarbons

38 Methanol and ethanol belong to the same homologous series.

What does this mean?

A Their molecules contain atoms only of carbon and hydrogen.

B Their molecules have the same number of carbon atoms.

C They have the same functional group.

D They have the same relative molecular mass.

39 Which substances can be obtained by cracking hydrocarbons?

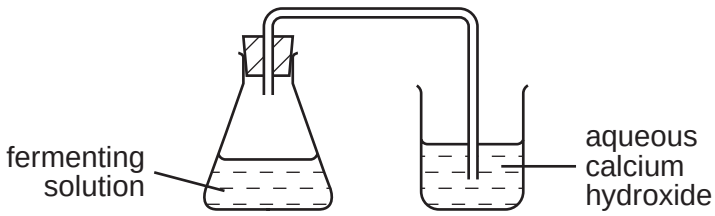
A ethanol and ethene

B ethanol and hydrogen

C ethene and hydrogen

D ethene and poly(ethene)

40 The apparatus shown may be used to study the products of fermentation.



What is the purpose of the aqueous calcium hydroxide?

A to absorb any excess of yeast

B to condense the ethanol produced

C to prevent air entering the system

D to show that carbon dioxide is produced

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DATA SHEET
The Periodic Table of the Elements

Group																	
I	II											III	IV	V	VI	VII	0
							1 H Hydrogen 1										4 He Helium 2
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 = 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.).