Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CHEMISTRY **0620/13**

Paper 1 Multiple Choice (Core) **October/November 2016**

45 minutes

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

3471311180

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, 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.
DO **NOT** WRITE IN ANY BARCODES.

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.
Electronic calculators may be used.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **17** printed pages and **3** blank pages.

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1 ‘Particles moving **very slowly** from an area of higher concentration to an area of lower concentration.’

Which process is being described?

A a liquid being frozen

B a solid melting

C a substance diffusing through a liquid

D a substance diffusing through the air

2 A student mixes 25 cm^3 samples of dilute hydrochloric acid with different volumes of aqueous sodium hydroxide.

In each case, the student measures the change in temperature to test if the reaction is exothermic.

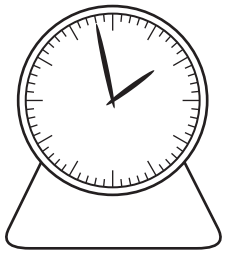
Which piece of apparatus is **not** needed?

A



burette

B



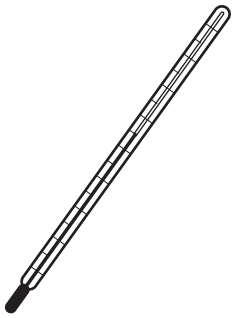
clock

C



pipette

D

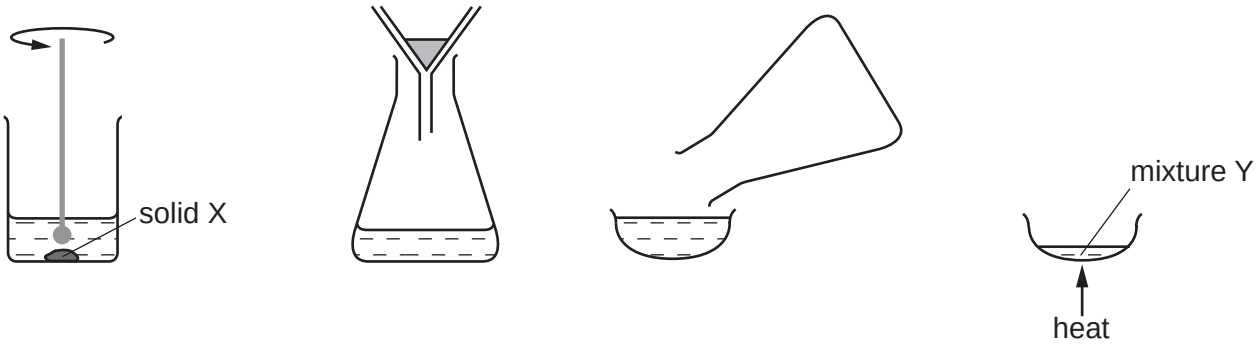


thermometer

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3 A solid X is purified in five steps.

The first four steps of the purification are shown in the diagram.



step 1 step 2 step 3 step 4

In **step 5**, how is a pure sample of solid X obtained from mixture Y?

A dissolving

B distillation

C evaporating

D filtering

4 An atom has three electron shells. There are three electrons in the outer shell.

How many protons and how many neutrons are in this atom?

	protons	neutrons
A	13	14
B	13	27
C	14	13
D	21	24

5 Boron nitride is a compound of the elements boron and nitrogen.

It has a similar structure to diamond.

What is likely to be a property of boron nitride?

A It conducts electricity.

B It is soluble in water.

C It is used as a lubricant.

D It is very hard.

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6 Which row describes the formation of single covalent bonds in methane?

A	atoms share a pair of electrons	both atoms gain a noble gas electronic structure
B	atoms share a pair of electrons	both atoms have the same number of electrons in their outer shell
C	electrons are transferred from one atom to another	both atoms gain a noble gas electronic structure
D	electrons are transferred from one atom to another	both atoms have the same number of electrons in their outer shell

7 Which elements are in the compound $BaCO_3$?

A barium and cobalt

B boron, actinium and oxygen

C carbon, oxygen and barium

D oxygen, calcium and boron

8 Concentrated aqueous sodium iodide is electrolysed using platinum electrodes.

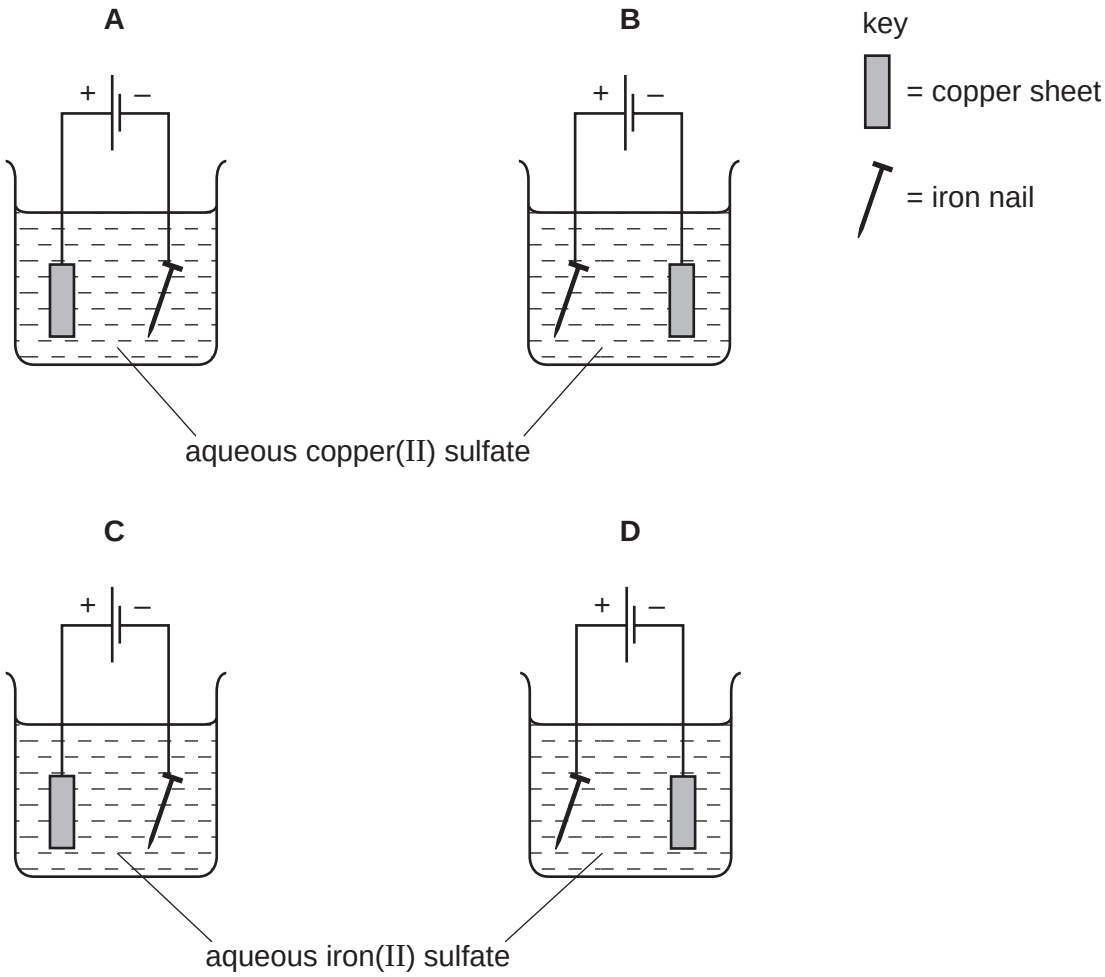
The solution contains the ions Na^+, I^-, H^+ and OH^-.

Which electrodes are the ions attracted to during this electrolysis?

	cathode	anode
A	H^+ and Na^+	I^- and OH^-
B	H^+ and OH^-	I^- and Na^+
C	I^- and Na^+	H^+ and OH^-
D	I^- and OH^-	H^+ and Na^+

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9 Which apparatus could be used to electroplate an iron nail with copper?



10 10 g of ammonium nitrate are added to water at 25 °C and the mixture stirred. The ammonium nitrate dissolves and, after one minute, the temperature of the solution is 10 °C.

Which word describes this change?

A endothermic

B exothermic

C neutralisation

D reduction

11 What is **always** produced when a fuel is burnt?

A carbon dioxide

B carbon monoxide

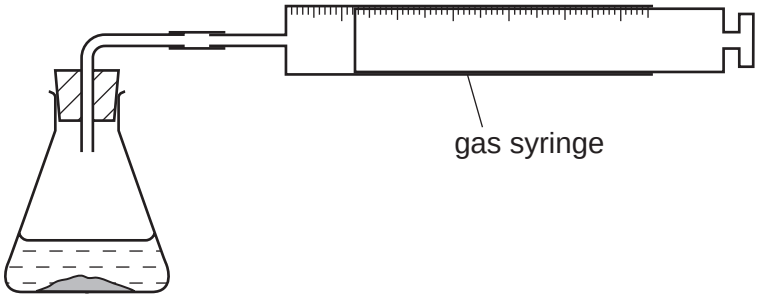
C heat energy

D oxides of nitrogen

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[Turn over

12 An experiment X is carried out between a solid and a solution using the apparatus shown.

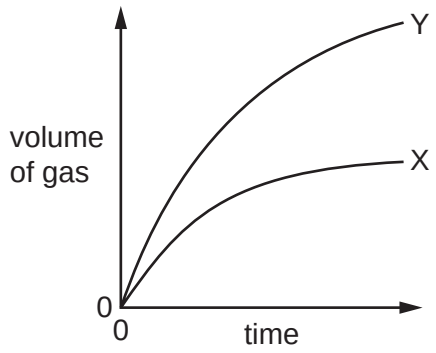


The volume of gas given off is measured at different times and the results plotted on a graph.

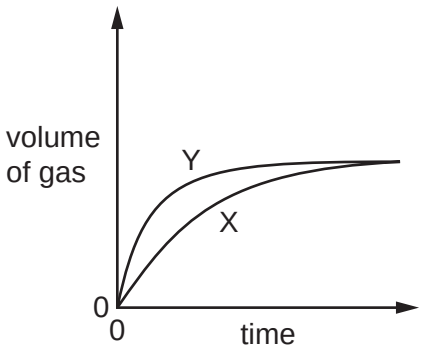
In a second experiment Y, the surface area of the solid is increased but all other factors remain the same.

Which graph shows the results of experiments X and Y?

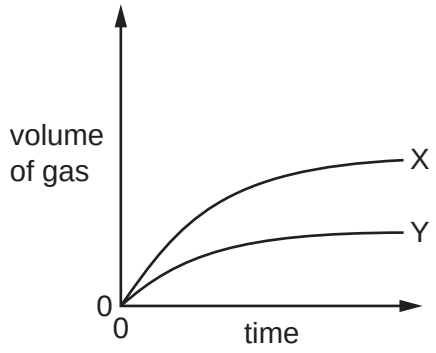
A



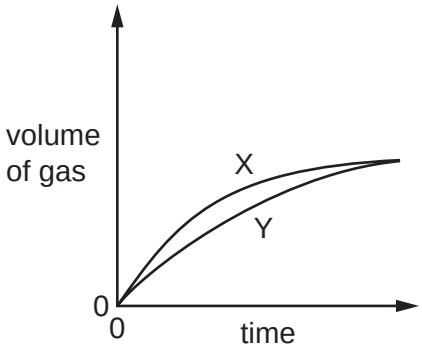
B



C



D



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13 Hydrated cobalt(II) chloride crystals are pink.

When they are heated, they lose water and form blue anhydrous cobalt(II) chloride.

$$\text{hydrated cobalt(II) chloride} \rightleftharpoons \text{anhydrous cobalt(II) chloride} + \text{water}$$

A few drops of vinegar were added to anhydrous cobalt(II) chloride.

There was a colour change from blue to pink.

What does this colour change show about vinegar?

A It contains an acid.

B It contains water.

C It is an alkali.

D It is anhydrous.

14 The equations for three reactions are shown.

1 $CuO + H_2 \rightarrow Cu + H_2O$

2 $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

3 $2H_2 + O_2 \rightarrow 2H_2O$

Which statement about the reactions is **not** correct?

A In reaction 1, copper(II) oxide is reduced to copper.

B In reaction 2, carbon monoxide is oxidised to carbon dioxide.

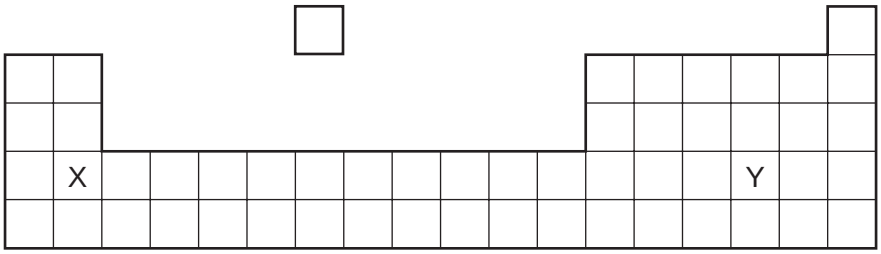
C In reactions 1 and 3, hydrogen is oxidised to water.

D In reaction 2, iron(III) oxide is oxidised to iron.

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[Turn over

15 Part of the Periodic Table is shown.



Which type of oxides do X and Y form?

	X	Y
A	acidic	acidic
B	acidic	basic
C	basic	acidic
D	basic	basic

16 Compound T is added to dilute hydrochloric acid and warmed gently.

The mixture gives off a gas which turns acidified aqueous potassium manganate(VII) from purple to colourless.

A flame test on compound T gives a lilac flame.

What is compound T?

A sodium sulfate

B sodium sulfite

C potassium sulfate

D potassium sulfite

17 Acids can react with metal oxides, carbonates and metals.

Which reactions produce a gas?

	acid with metal oxide	acid with carbonate	acid with metal
A	✓	✓	✓
B	✓	✗	✗
C	✗	✓	✓
D	✗	✓	✗

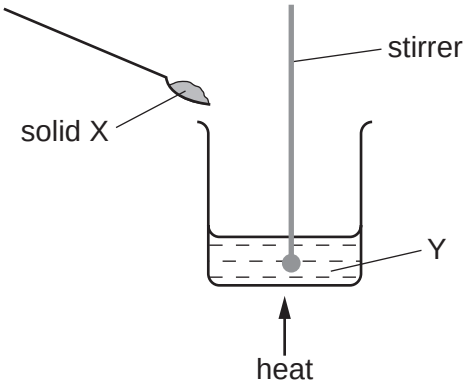
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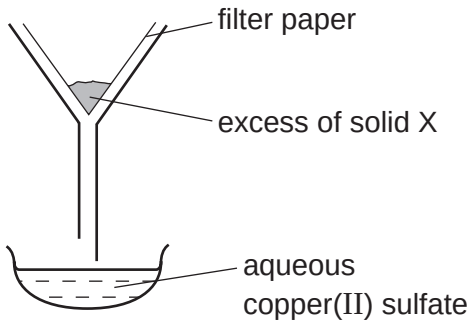
✓ = gas is produced

✗ = no gas is produced

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18 The apparatus shown is used to prepare aqueous copper(II) sulfate.





What are X and Y?

	X	Y
A	copper	aqueous iron(II) sulfate
B	copper(II) chloride	sulfuric acid
C	copper(II) oxide	sulfuric acid
D	sulfur	aqueous copper(II) chloride

19 Elements P and Q are in the same period of the Periodic Table.

P is a metal and Q is a non-metal.

Which statement is correct?

A P has a greater nucleon number than Q.

B P is to the right of Q in the period.

C Q has more electron shells than P.

D Q has more protons than P.

20 What is **not** a property of Group I metals?

A They are soft and can be cut with a knife.

B They react when exposed to oxygen in the air.

C They produce an acidic solution when they react with water.

D They react rapidly with water producing hydrogen gas.

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[Turn over

21 A flammable gas needs to be removed from a tank at an industrial plant.

For safety reasons, an inert gas is used.

Which gas is suitable?

A argon

B hydrogen

C methane

D oxygen

22 Which element is a transition element?

	colour of chloride	melting point of element / °C
A	orange	113
B	orange	1535
C	white	113
D	white	1535

23 Which statement about the element bromine is correct?

A It displaces chlorine from aqueous potassium chloride.

B It has a higher density than chlorine.

C It is a diatomic metal.

D It is a green gas at room temperature.

24 Four metals are listed in decreasing order of reactivity.

magnesium

zinc

iron

copper

Titanium reacts with acid and cannot be extracted from its ore by heating with carbon.

Where should titanium be placed in the list?

A below copper

B between iron and copper

C between magnesium and zinc

D between zinc and iron

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25 Basic oxides and oxygen are used to convert iron into steel.

Which statement is **not** correct?

A Carbon is converted into carbon dioxide.

B Silicon is converted into silicon(IV) oxide.

C The basic oxides react with acidic impurities to form slag.

D The oxygen reacts with the iron to produce hematite.

26 A student added dilute hydrochloric acid to four metals and recorded the results.

Some of the results are **not** correct.

	results	
	metal	gas given off
1	copper	yes
2	iron	yes
3	magnesium	no
4	zinc	yes

Which **two** results are correct?

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

27 Some properties of aluminium are listed.

1 It conducts heat.

2 It has a low density.

3 It is mechanically strong.

4 It is resistant to corrosion.

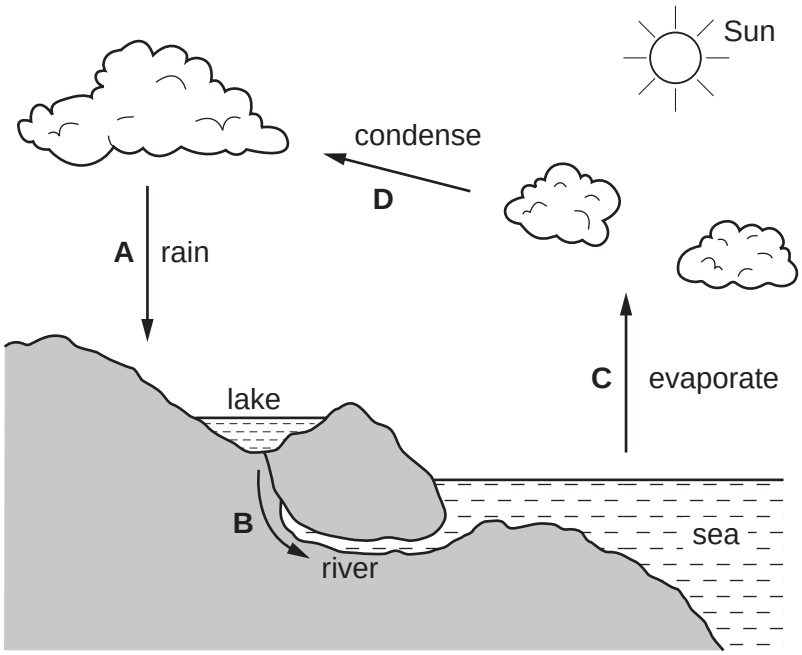
Which properties make aluminium suitable for making food containers for chilled food products?

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

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28 The diagram represents the water cycle.

At which stage during the cycle are soluble impurities removed from the water?



29 Air is a mixture of gases.

Which gas is present in the largest amount?

A argon

B carbon dioxide

C nitrogen

D oxygen

30 Which information about carbon dioxide and methane is correct?

		carbon dioxide	methane
A	formed when vegetation decomposes	✓	✗
B	greenhouse gas	✓	✓
C	present in unpolluted air	✗	✗
D	produced during respiration	✗	✓

key

✓ = true

✗ = false

31 Calcium oxide and ammonium salts are used by farmers to treat soils.

Why are these **two** substances added at different times?

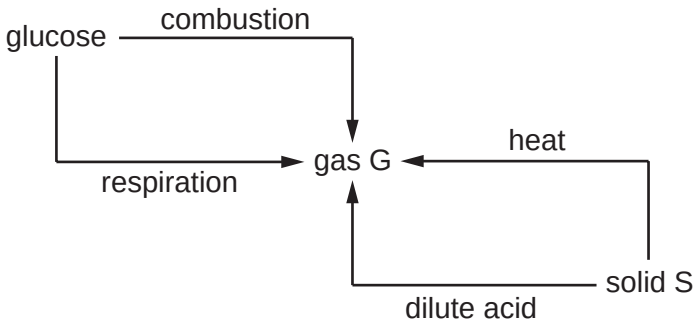
A They are both acidic.

B They are both basic.

C They react with each other to produce ammonia.

D They react with each other to produce hydrogen.

32 The chart shows how a gas, G, is formed in four reactions, from glucose or from a solid, S.



What are the formulae of gas G and solid S?

	gas G	solid S
A	CH_4	Ca
B	CH_4	$CaCO_3$
C	CO_2	Ca
D	CO_2	$CaCO_3$

33 Slaked lime is used to neutralise an acidic soil.

How does the pH of the soil change?

	from	to
A	6	7
B	7	8
C	8	7
D	8	6

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[Turn over

34 Which list shows the fractions obtained from distilling petroleum, in order of increasing boiling point?

A bitumen → diesel oil → fuel oil → lubricating oil

B diesel oil → gasoline → naphtha → kerosene

C gasoline → naphtha → kerosene → diesel oil

D kerosene → lubricating oil → naphtha → refinery gas

35 Butane reacts as shown.

$$\text{butane} \xrightarrow[\text{and heat}]{\text{catalyst}} \text{butene} + \text{hydrogen}$$

What is this type of reaction?

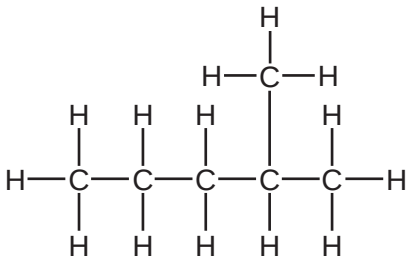
A combustion

B cracking

C polymerisation

D reduction

36 The structure of a compound, X, is shown.



To which homologous series does X belong?

A alcohols

B alkanes

C alkenes

D carboxylic acids

37 An organic compound has the following properties.

colour	effect on Universal Indicator	flammability	effect on aqueous bromine	state at room temperature
colourless	none	highly flammable	decolourises	gas

To which homologous series does this organic compound belong?

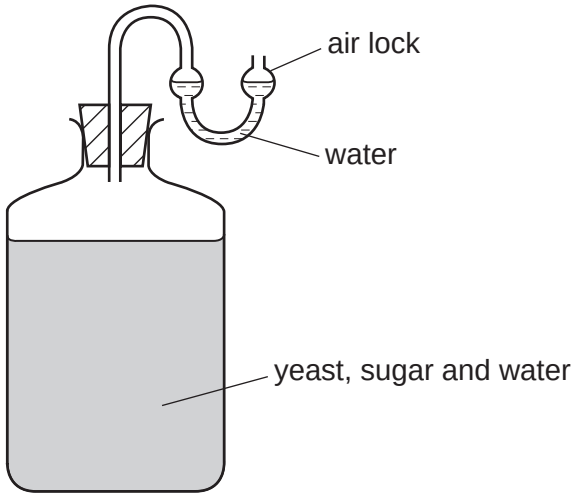
A alcohols

B alkanes

C alkenes

D carboxylic acids

38 The diagram shows some apparatus.



What is made using this apparatus?

A ethane

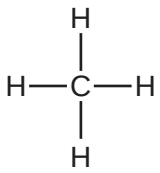
B ethanoic acid

C ethanol

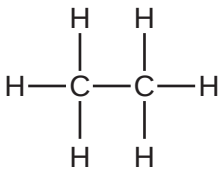
D ethene

39 Which molecule can be polymerised?

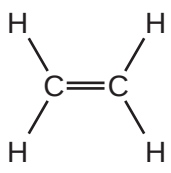
A



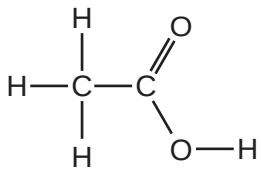
B



C



D



40 Ethanol is used as a biofuel.

Which equation shows the complete combustion of ethanol?

A $C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 2H_2O$

B $C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$

C $2C_2H_5OH + 6O_2 \rightarrow 4CO_2 + 4H_2O$

D $2C_2H_5OH + 7O_2 \rightarrow 4CO_2 + 6H_2O$

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The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	VIII
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
11 Na sodium 23	12 Mg magnesium 24											13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium –	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –
87 Fr francium –	88 Ra radium –	89–103 actinoids	104 Rf rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –		114 Fl flerovium –		116 Lv livermorium –		

Key

atomic number
atomic symbol
name
relative atomic mass

lanthanoids	57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium –	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
actinoids	89 Ac actinium –	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium –	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californium –	99 Es einsteinium –	100 Fm fermium –	101 Md mendelevium –	102 No nobelium –	103 Lr lawrencium –

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