



Cambridge O Level

CHEMISTRY

5070/12

Paper 1 Multiple Choice

May/June 2020

1 hour

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- 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 multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

INFORMATION

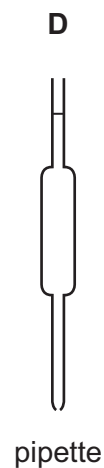
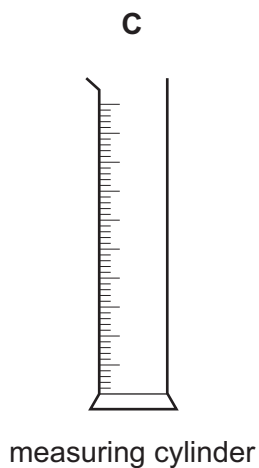
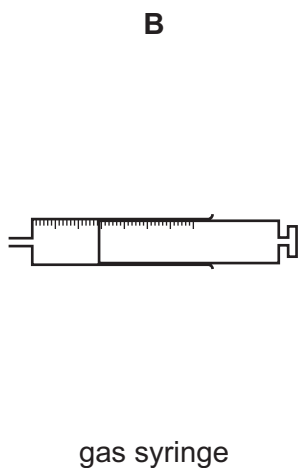
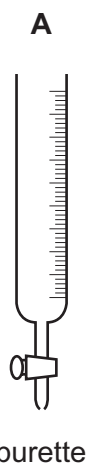
- The total mark for this paper is 40.
- Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **20** pages. Blank pages are indicated.



- 1 The diagram shows four pieces of apparatus that are used to measure the volume of a gas or liquid.

Which piece of apparatus should always be filled to the same level?



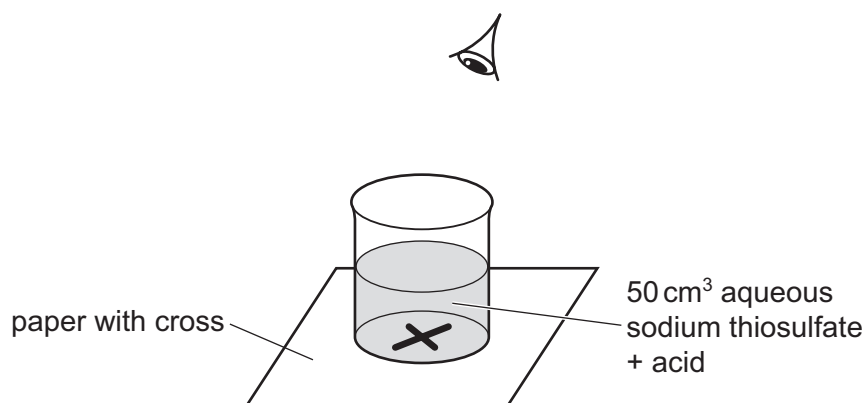
2 Aqueous sodium thiosulfate reacts with acid to make a precipitate of sulfur.



A student investigates the effect of temperature on the rate of this reaction.

The student:

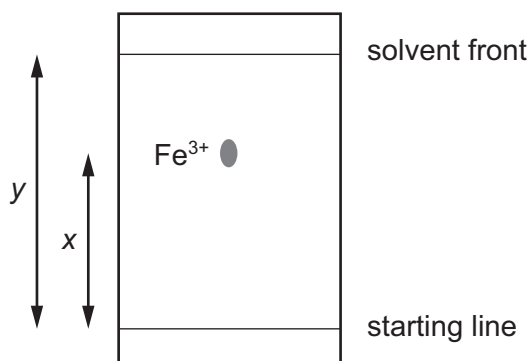
- places a piece of paper with a cross on it below the reaction mixture as shown in the diagram
- measures the time taken for the cross to no longer be seen
- repeats the reaction at different temperatures.



Which apparatus is needed for this investigation?

- A** balance, pipette, stop-clock
- B** balance, stop-clock, thermometer
- C** burette, gas syringe, thermometer
- D** measuring cylinder, stop-clock, thermometer

- 3 A paper chromatography experiment is carried out to find an R_f value for $\text{Fe}^{3+}(\text{aq})$. The result is shown.



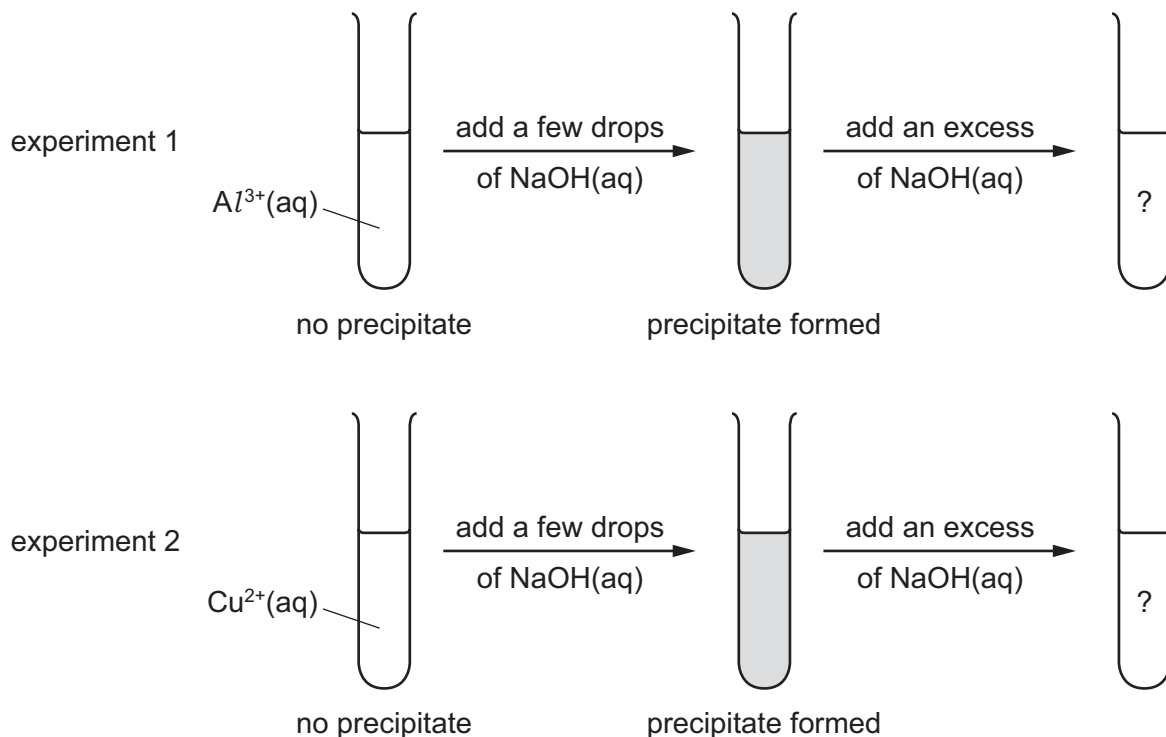
To make the spot containing $\text{Fe}^{3+}(\text{aq})$ more visible, the paper is sprayed with aqueous sodium hydroxide so that a precipitate of iron(III) hydroxide forms.

Under the conditions of the experiment, the R_f of $\text{Fe}^{3+}(\text{aq})$ is given by1..... and the colour of the precipitate is2..... .

Which row correctly completes gaps 1 and 2?

	gap 1	gap 2
A	$\frac{x}{y}$	red-brown
B	$\frac{x}{y}$	green
C	$\frac{y}{x}$	red-brown
D	$\frac{y}{x}$	green

4 The diagram shows two experiments.



What are the results of adding an excess of NaOH(aq) in each experiment?

	experiment 1	experiment 2
A	✓	✓
B	✓	x
C	x	✓
D	x	x

key

✓ = precipitate remains

x = precipitate dissolves

5 Which methods of separation require a change of state from liquid to gas?

- 1 paper chromatography
- 2 crystallisation
- 3 distillation
- 4 filtration

A 1 and 2

B 1 and 3

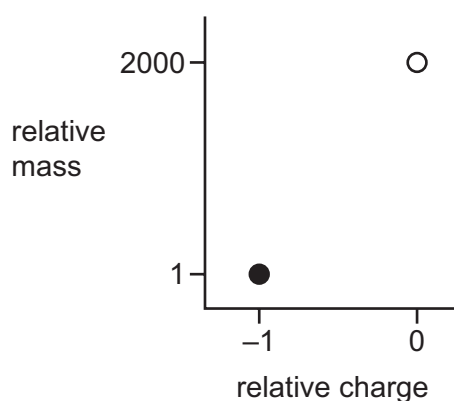
C 2 and 3

D 3 and 4

- 6 Hydrogen sulfide, H_2S , and hydrogen chloride, HCl , are both gases at temperatures above -50°C .

Which gas will diffuse most rapidly at the temperature given?

- A hydrogen chloride at -40°C
 B hydrogen chloride at -20°C
 C hydrogen sulfide at -40°C
 D hydrogen sulfide at -20°C
- 7 The diagram shows the relative mass and the relative charge of two particles, \circ and \bullet , present in atoms and ions.



Which of these particles are present in a hydrogen atom and in a hydrogen ion?

	H	H^+
A	both \circ and \bullet	both \circ and \bullet
B	both \circ and \bullet	\circ but not \bullet
C	\bullet but not \circ	neither \circ nor \bullet
D	\circ but not \bullet	\bullet but not \circ

- 8 Which ion has the most shells that contain electrons?
 A Al^{3+} B Be^{2+} C N^{3-} D S^{2-}
- 9 Which substance conducts electricity both when solid and when molten?
 A an alloy
 B a hydrocarbon
 C a metal oxide
 D a salt

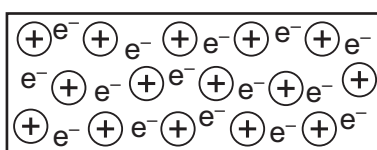
10 When they react together, which pair of elements form an ionic compound?

- A carbon and hydrogen
- B hydrogen and chlorine
- C lithium and oxygen
- D sulfur and oxygen

11 How many shared electrons are in one carbon dioxide molecule?

- A 2
- B 4
- C 8
- D 12

12 Element X has a lattice of positive ions and a 'sea of electrons'.



Which property will X have?

- A It conducts electricity by the movement of ions and electrons.
- B It has a high melting point.
- C It is decomposed by an electric current.
- D It is not malleable.

13 Which row shows the correct state symbols for the reaction between calcium carbonate and dilute hydrochloric acid? (The conditions are room temperature and pressure.)

	$\text{CaCO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$				
A	s	aq	aq	aq	g
B	s	l	aq	l	g
C	s	l	l	aq	g
D	s	aq	aq	l	g

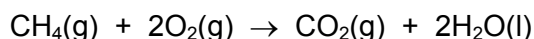
- 14 The expression shown for the value of A_r for fluorine is incomplete.

$$A_r(\text{fluorine}) = \frac{\text{average mass of one1..... of fluorine}}{\text{.....2..... of the mass of one atom of } {}^{12}_6\text{C}}$$

How should the gaps in the expression be correctly completed?

	gap 1	gap 2
A	atom	$\frac{1}{6}$
B	atom	$\frac{1}{12}$
C	molecule	$\frac{1}{6}$
D	molecule	$\frac{1}{12}$

- 15 A mixture of 5 cm³ of CH₄ and 100 cm³ of air is exploded. Assume air is 80% N₂ by volume and 20% O₂ by volume. The resulting mixture is cooled. All volumes are measured at room temperature and pressure.



What is the composition of the resulting gas?

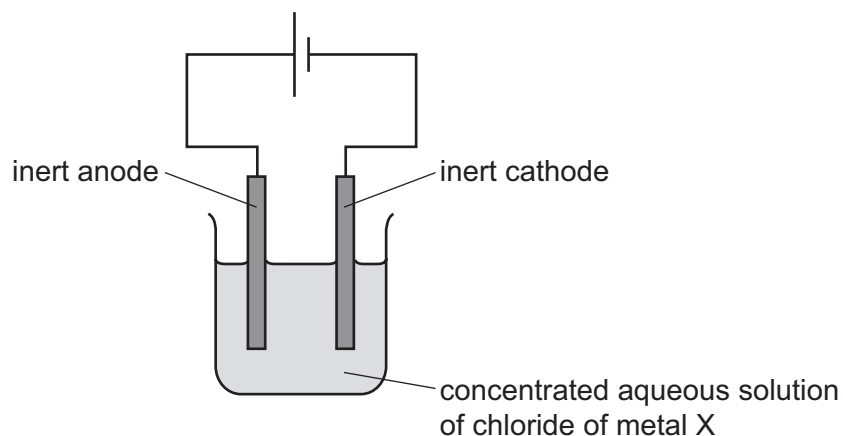
	5 cm ³ of CO ₂	10 cm ³ of O ₂	80 cm ³ of N ₂	10 cm ³ of steam
A	✓	✓	✓	✓
B	✓	✓	✓	x
C	✓	x	✓	✓
D	✓	x	✓	x

- 16 Which arrangement is used to electroplate copper onto a steel key?

	electrolyte	anode (positive electrode)	cathode (negative electrode)
A	aqueous copper(II) sulfate	piece of pure copper	steel key
B	aqueous copper(II) sulfate	steel key	piece of pure copper
C	dilute sulfuric acid	piece of pure copper	steel key
D	dilute sulfuric acid	steel key	piece of pure copper

17 The chloride of metal X is dissolved in water.

A concentrated solution of this chloride is electrolysed using inert electrodes.



X is above sodium in the reactivity series.

In addition to chlorine, which gas is liberated and at which electrode?

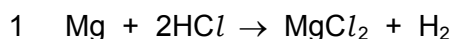
	gas	liberated at electrode
A	hydrogen	anode
B	hydrogen	cathode
C	oxygen	anode
D	oxygen	cathode

18 Which change in conditions, for the reaction between zinc and dilute sulfuric acid, increases the rate of reaction by lowering the activation energy?

- A** adding a catalyst
- B** increasing the concentration of the acid
- C** increasing the surface area of the zinc
- D** increasing the temperature

19 Many reactions can be classified as redox reactions.

Which equations show redox reactions?



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

- 20 Which row correctly shows whether the hydrogen ion concentration and the pH of ethanoic acid are higher or lower than those of hydrochloric acid of the same concentration?

	hydrogen ion concentration	pH
A	higher	higher
B	higher	lower
C	lower	higher
D	lower	lower

- 21 Which aqueous reagent liberates ammonia from ammonium nitrate on warming?

- A** calcium nitrate
B potassium hydroxide
C sodium chloride
D sulfuric acid

- 22 Two fertilisers are made by mixing chemical compounds.

Fertiliser X contains 500 g of NH_4NO_3 and 500 g of $(\text{NH}_4)_2\text{SO}_4$ per kilogram.

Fertiliser Y contains 700 g of NH_4NO_3 and 300 g of CaSO_4 per kilogram.

Which fertiliser contains the higher percentage of nitrogen by mass and which contains the higher percentage of sulfur by mass?

[M_r : NH_4NO_3 , 80; $(\text{NH}_4)_2\text{SO}_4$, 132; CaSO_4 , 136]

	fertiliser with higher percentage N	fertiliser with higher percentage S
A	X	X
B	X	Y
C	Y	X
D	Y	Y

23 Which processes occur in the manufacture of sulfuric acid?

- 1 burning sulfur in air
- 2 dissolving sulfur dioxide in sulfuric acid
- 3 dissolving sulfur dioxide in water
- 4 reacting sulfur dioxide with air

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

24 A lump of element X can be cut by a knife.

During its reaction with water, X floats and melts.

What is X?

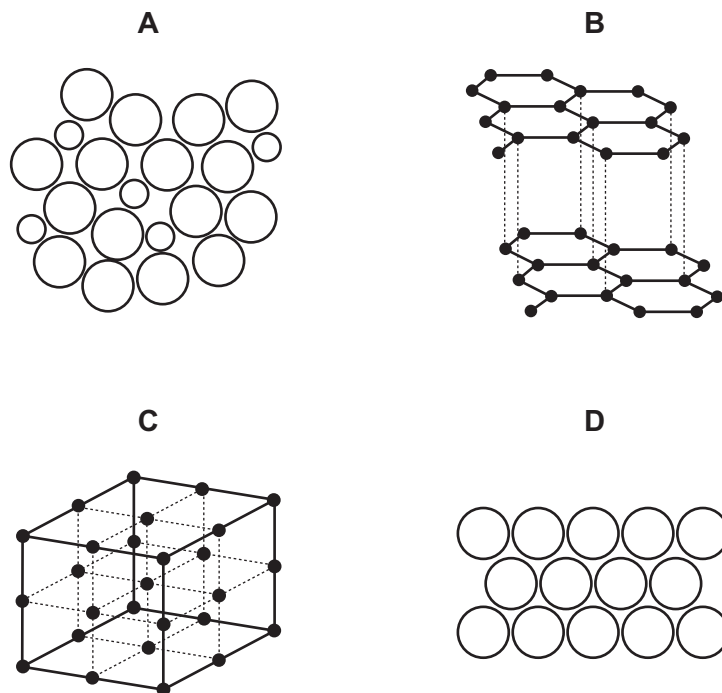
- A** calcium
- B** copper
- C** magnesium
- D** potassium

25 Chlorine is passed into separate samples of aqueous potassium iodide and aqueous potassium bromide.

In which solutions is there a colour change?

	KI(aq)	KBr(aq)	
A	✓	✓	key
B	✓	x	✓ = yes
C	x	✓	x = no
D	x	x	

26 Which diagram shows the structure of an alloy?



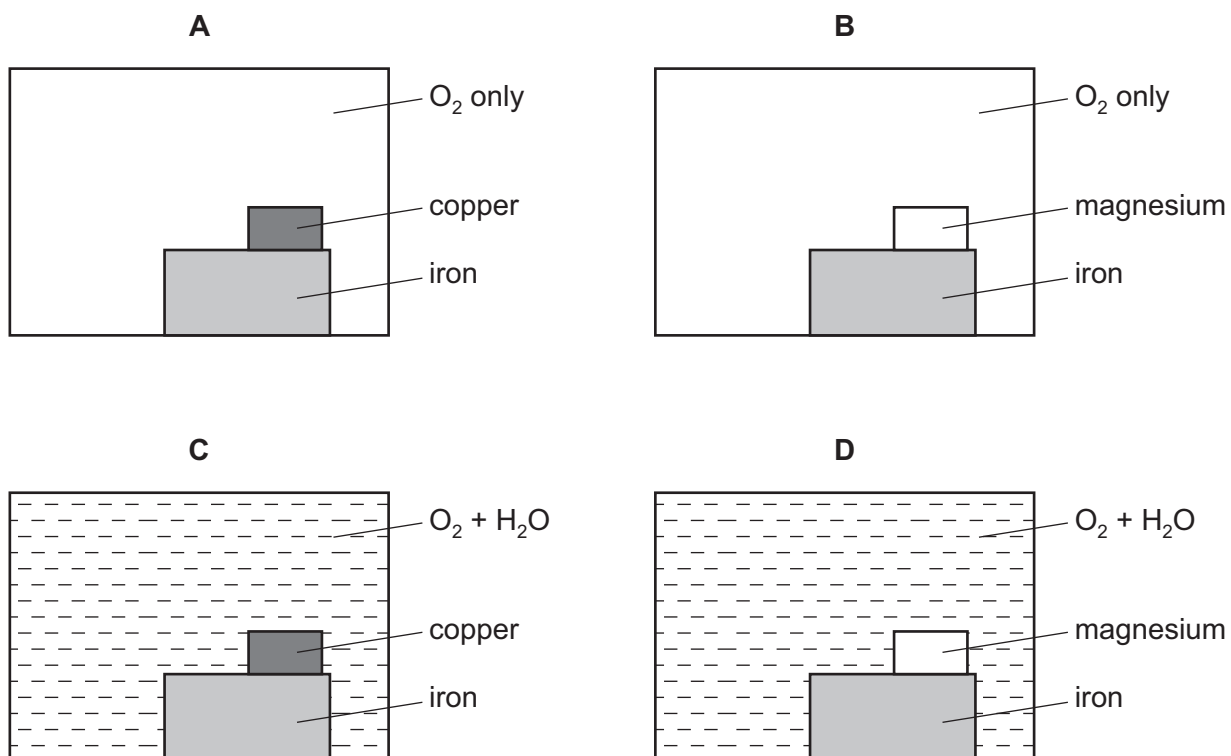
27 Which element can only be extracted from its ore using electrolysis?

- A** calcium
- B** copper
- C** lead
- D** silver

28 Which equation shows a thermal decomposition that occurs in the blast furnace?

- A** $C + O_2 \rightarrow CO_2$
- B** $CO_2 + C \rightarrow 2CO$
- C** $CaCO_3 \rightarrow CaO + CO_2$
- D** $CaO + SiO_2 \rightarrow CaSiO_3$

- 29 Which diagram correctly shows the conditions necessary for the rusting of iron and also the metal that can be used to prevent rusting by sacrificial protection?



- 30 Aluminium is produced by the electrolysis of pure aluminium oxide. One of the electrodes in the process has to be replaced often.

Which statement is correct?

- A The product at the anode reacts with the anode.
 - B The product at the anode reacts with the cathode.
 - C The product at the cathode reacts with the anode.
 - D The product at the cathode reacts with the cathode.
- 31 Which row correctly compares carbon dioxide and methane?

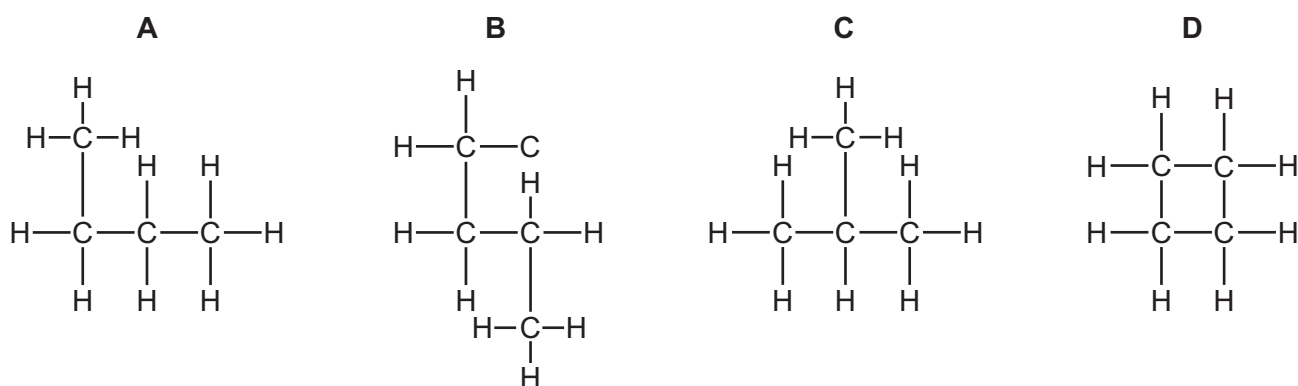
	both contain carbon	both are described as a greenhouse gas	both lower the pH of water when they dissolve in it
A	✓	x	✓
B	✓	✓	x
C	x	✓	✓
D	x	✓	x

32 Sea water has to be purified in order to obtain drinking water from it.

Which processes are used to purify the sea water?

	fractional distillation	desalination	
A	✓	✓	key ✓ = used x = not used
B	✓	x	
C	x	✓	
D	x	x	

33 Which structure represents an isomer of butane?



34 Which statement about the organic compounds CH_4 , C_2H_4 , C_2H_6 and C_3H_8 is correct?

- A** Only C_2H_4 and C_2H_6 decolourise bromine water.
- B** They are all saturated compounds.
- C** They are all unsaturated compounds.
- D** They are all hydrocarbons.

35 The alkenes are a homologous series.

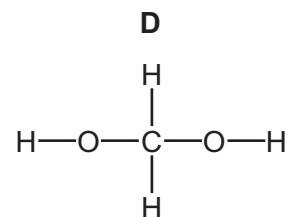
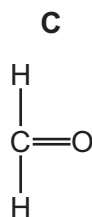
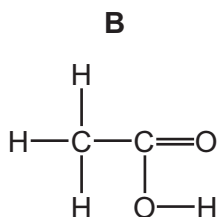
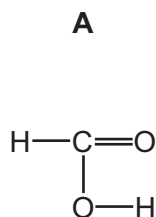
Which statement about alkenes is correct?

- A** An alkene molecule contains four fewer hydrogen atoms than an alkane molecule with the same number of carbon atoms.
- B** If a food is described as *polyunsaturated* it means that it contains polymers.
- C** Propene reacts with steam to form propanol.
- D** The general formula for the alkenes is $\text{C}_n\text{H}_{2n+2}$.

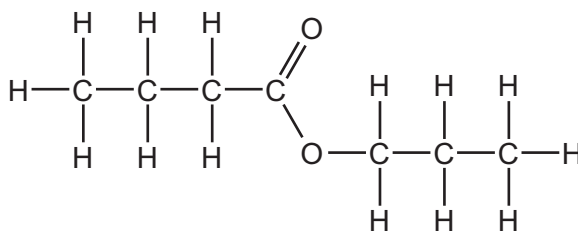
36 Which organic compound is used as a solvent, a renewable fuel and in the production of vinegar?

- A ethanoic acid
- B ethanol
- C propanoic acid
- D propanol

37 Which structure shows the carboxylic acid with the lowest relative molecular mass?

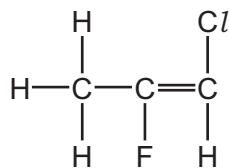


38 What is the name of the ester shown?



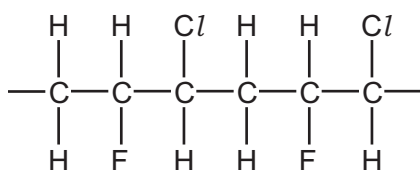
- A butyl propanoate
- B propyl butanoate
- C propyl ethanoate
- D propyl propanoate

39 The diagram shows the structure of a monomer.

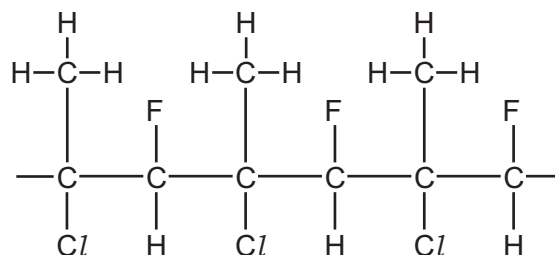


Which diagram shows the partial structure of its polymer?

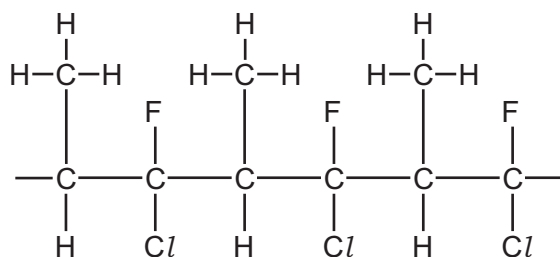
A



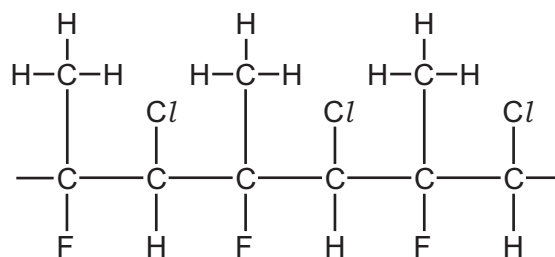
B



C



D



40 Which statement about polymers is correct?

- A** Nylon and *Terylene* are produced by addition polymerisation.
- B** Nylon and *Terylene* both contain amide linkages.
- C** Simple sugars are produced by hydrolysing proteins.
- D** Starch contains the elements carbon, hydrogen and oxygen.

BLANK PAGE

BLANK PAGE

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.

The Periodic Table of Elements

		Group																																																																																																																																																																																																			
I	II	III	IV	V	VI	VII	VIII																																																																																																																																																																																														
3 Li lithium 7	4 Be beryllium 9	11 Na sodium 23	12 Mg magnesium 24	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	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 Ac actinium —	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 —	118 Og oganeson —	119 Uue unbinilium —	120 Uub unbinilium —	121 Uut ununilium —	122 Uuq ununilium —	123 Uup ununilium —	124 Uuq ununilium —	125 Uup ununilium —	126 Uuq ununilium —	127 Uup ununilium —	128 Uuq ununilium —	129 Uup ununilium —	130 Uuq ununilium —	131 Uup ununilium —	132 Uuq ununilium —	133 Uup ununilium —	134 Uuq ununilium —	135 Uup ununilium —	136 Uuq ununilium —	137 Uup ununilium —	138 Uuq ununilium —	139 Uup ununilium —	140 Uuq ununilium —	141 Uup ununilium —	142 Uuq ununilium —	143 Uup ununilium —	144 Uuq ununilium —	145 Uup ununilium —	146 Uuq ununilium —	147 Uup ununilium —	148 Uuq ununilium —	149 Uup ununilium —	150 Uuq ununilium —	151 Uup ununilium —	152 Uuq ununilium —	153 Uup ununilium —	154 Uuq ununilium —	155 Uup ununilium —	156 Uuq ununilium —	157 Uup ununilium —	158 Uuq ununilium —	159 Uup ununilium —	160 Uuq ununilium —	161 Uup ununilium —	162 Uuq ununilium —	163 Uup ununilium —	164 Uuq ununilium —	165 Uup ununilium —	166 Uuq ununilium —	167 Uup ununilium —	168 Uuq ununilium —	169 Uup ununilium —	170 Uuq ununilium —	171 Uup ununilium —	172 Uuq ununilium —	173 Uup ununilium —	174 Uuq ununilium —	175 Uup ununilium —	176 Uuq ununilium —	177 Uup ununilium —	178 Uuq ununilium —	179 Uup ununilium —	180 Uuq ununilium —	181 Uup ununilium —	182 Uuq ununilium —	183 Uup ununilium —	184 Uuq ununilium —	185 Uup ununilium —	186 Uuq ununilium —	187 Uup ununilium —	188 Uuq ununilium —	189 Uup ununilium —	190 Uuq ununilium —	191 Uup ununilium —	192 Uuq ununilium —	193 Uup ununilium —	194 Uuq ununilium —	195 Uup ununilium —	196 Uuq ununilium —	197 Uup ununilium —	198 Uuq ununilium —	199 Uup ununilium —	200 Uuq ununilium —	201 Uup ununilium —	202 Uuq ununilium —	203 Uup ununilium —	204 Uuq ununilium —	205 Uup ununilium —	206 Uuq ununilium —	207 Uup ununilium —	208 Uuq ununilium —	209 Uup ununilium —	210 Uuq ununilium —	211 Uup ununilium —	212 Uuq ununilium —	213 Uup ununilium —	214 Uuq ununilium —	215 Uup ununilium —	216 Uuq ununilium —	217 Uup ununilium —	218 Uuq ununilium —	219 Uup ununilium —	220 Uuq ununilium —	221 Uup ununilium —	222 Uuq ununilium —	223 Uup ununilium —	224 Uuq ununilium —	225 Uup ununilium —	226 Uuq ununilium —	227 Uup ununilium —	228 Uuq ununilium —	229 Uup ununilium —	230 Uuq ununilium —	231 Uup ununilium —	232 Uuq ununilium —	233 Uup ununilium —	234 Uuq ununilium —	235 Uup ununilium —	236 Uuq ununilium —	237 Uup ununilium —	238 Uuq ununilium —	239 Uup ununilium —	240 Uuq ununilium —	241 Uup ununilium —	242 Uuq ununilium —	243 Uup ununilium —	244 Uuq ununilium —	245 Uup ununilium —	246 Uuq ununilium —	247 Uup ununilium —	248 Uuq ununilium —	249 Uup ununilium —	250 Uuq ununilium —	251 Uup ununilium —	252 Uuq ununilium —	253 Uup ununilium —	254 Uuq ununilium —	255 Uup ununilium —	256 Uuq ununilium —	257 Uup ununilium —	258 Uuq ununilium —	259 Uup ununilium —	260 Uuq ununilium —	261 Uup ununilium —	262 Uuq ununilium —	263 Uup ununilium —	264 Uuq ununilium —	265 Uup ununilium —	266 Uuq ununilium —	267 Uup ununilium —	268 Uuq ununilium —	269 Uup ununilium —	270 Uuq ununilium —	271 Uup ununilium —	272 Uuq ununilium —	273 Uup ununilium —	274 Uuq ununilium —	275 Uup ununilium —	276 Uuq ununilium —	277 Uup ununilium —	278 Uuq ununilium —	279 Uup ununilium —	280 Uuq ununilium —	281 Uup ununilium —	282 Uuq ununilium —	283 Uup ununilium —	284 Uuq ununilium —	285 Uup ununilium —	286 Uuq ununilium —	287 Uup ununilium —	288 Uuq ununilium —	289 Uup ununilium —	290 Uuq ununilium —	291 Uup ununilium —	292 Uuq ununilium —	293 Uup ununilium —	294 Uuq ununilium —	295 Uup ununilium —	296 Uuq ununilium —	297 Uup ununilium —	298 Uuq ununilium —	299 Uup ununilium —	300 Uuq ununilium —

Key

atomic number
atomic symbol
name
relative atomic mass

1
H
hydrogen
1

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
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 —

lanthanoids

actinoids

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).