
CHEMISTRY

5070/11

Paper 1 Multiple Choice

October/November 2019

1 hour

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



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 16.

Electronic calculators may be used.

This document consists of **15** printed pages and **1** blank page.

- 1 The concentration of aqueous sodium carbonate can be found by reaction with hydrochloric acid of known concentration. The indicator methyl orange is used.

Which items of equipment are needed?

- A burette, measuring cylinder, gas syringe
- B burette, measuring cylinder, thermometer
- C burette, pipette, conical flask
- D burette, pipette, stopwatch

- 2 Which process is involved in **all** of the following?

- 1 obtaining copper(II) sulfate crystals from aqueous copper(II) sulfate
- 2 obtaining ethanol from the fermentation of glucose
- 3 obtaining nitrogen from liquid air

- A crystallisation
- B evaporation
- C filtration
- D fractional distillation

- 3 In which reaction is a white precipitate present when the reaction is complete?

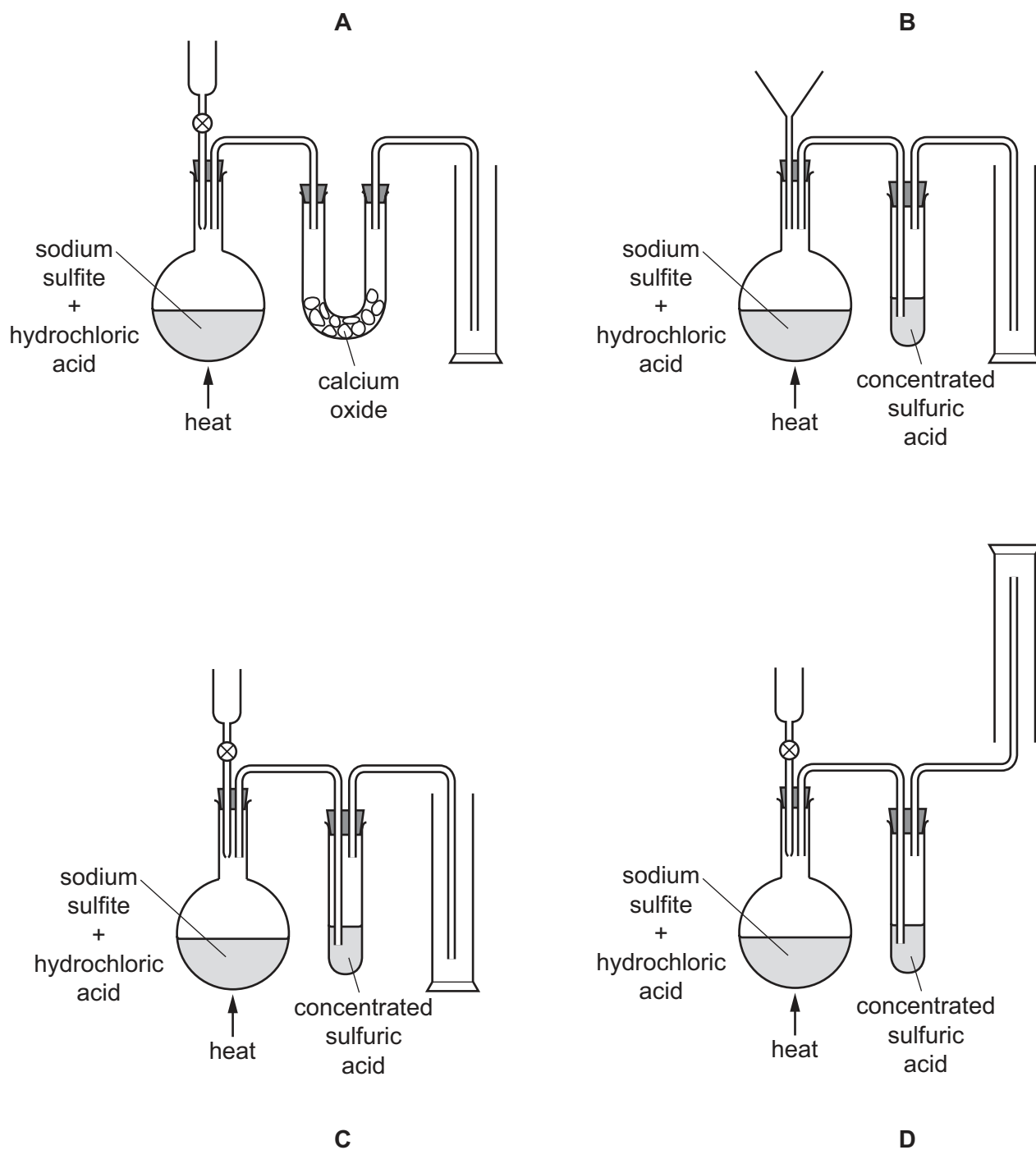
- A Excess aqueous barium nitrate is added to aqueous sodium chloride.
- B Excess aqueous sodium hydroxide is added to aqueous aluminium chloride.
- C Excess aqueous sodium hydroxide is added to aqueous iron(II) sulfate.
- D Excess hydrochloric acid is added to aqueous silver nitrate.

- 4 Which three elements exist as diatomic molecules at room temperature?

- A hydrogen, oxygen, helium
- B nitrogen, chlorine, neon
- C nitrogen, oxygen, fluorine
- D oxygen, chlorine, helium

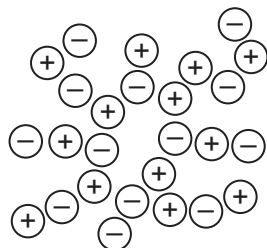
- 5 Sulfur dioxide is a gas that is prepared by heating sodium sulfite with hydrochloric acid. It is an acidic gas. Sulfur dioxide is more dense than air.

Which set of apparatus is suitable for preparing and collecting a dry sample of sulfur dioxide?

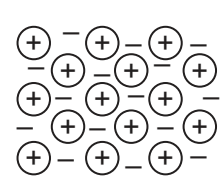


6 Which diagram best represents the structure of a solid metal?

A

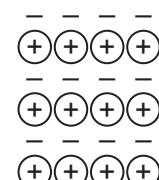


B

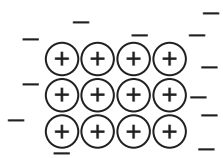


key
 ⊖ a negative ion
 ⊕ a positive ion
 - an electron

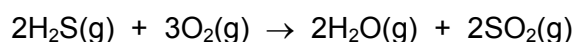
C



D



7 Hydrogen sulfide burns in an excess of oxygen according to the equation shown.



48 dm³ of hydrogen sulfide is burned.

Which volume of sulfur dioxide will be formed at room temperature and pressure?

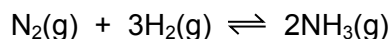
[All volumes are measured at the same temperature and pressure.]

A 24 dm³ **B** 36 dm³ **C** 48 dm³ **D** 96 dm³

8 Which row correctly identifies the different formulae of ethene and of its homologous series?

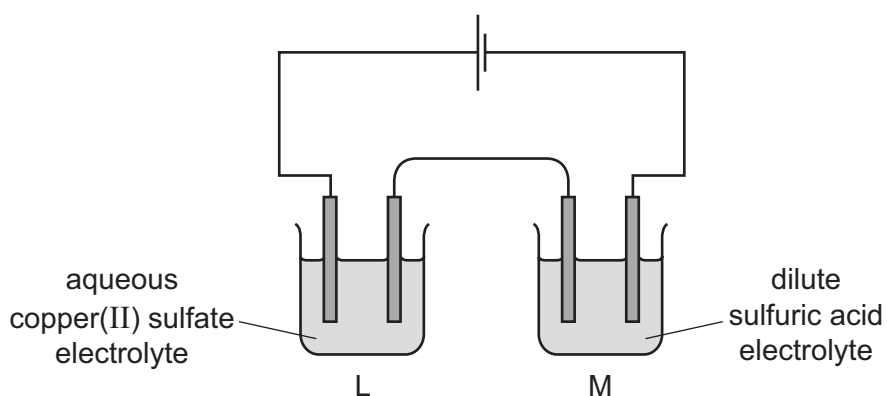
	CH ₂	C ₂ H ₄	C _n H _{2n}
A	empirical formula	molecular formula	general formula
B	empirical formula	general formula	molecular formula
C	general formula	molecular formula	empirical formula
D	molecular formula	empirical formula	general formula

- 9 Ammonia is manufactured from nitrogen and hydrogen by the Haber process.



What is the percentage yield when 60 kg of ammonia is produced from 60 kg of hydrogen?

- A 5.9% B 17.6% C 35.3% D 50.0%
- 10 What is the ratio of the number of molecules in 71 g of gaseous chlorine to the number of molecules in 2 g of gaseous hydrogen?
- A 1:1 B 1:2 C 2:1 D 71:2
- 11 The diagram shows an electrolysis experiment using inert electrodes.



Which row shows what happens to the concentration of the electrolyte in L and in M as the electrolysis proceeds?

	L	M
A	✓	✓
B	✓	x
C	x	✓
D	x	x

key

✓ = concentration stays constant

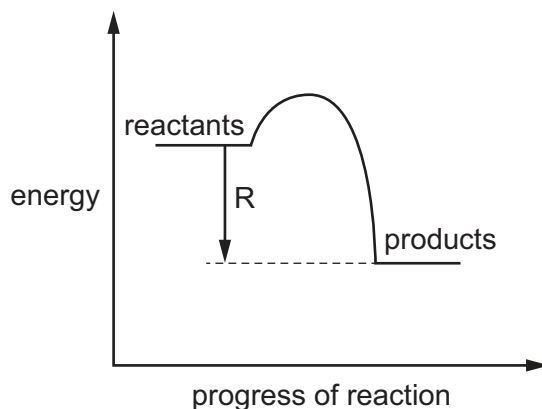
x = concentration does not stay constant

- 12 Molten sodium chloride is electrolysed.

Which equation correctly shows the reaction that occurs at the cathode?

- A $2\text{Cl}^- + 2\text{e}^- \rightarrow \text{Cl}_2$
- B $2\text{Cl}^- - 2\text{e}^- \rightarrow \text{Cl}_2$
- C $\text{Na}^+ + \text{e}^- \rightarrow \text{Na}$
- D $\text{Na}^+ - \text{e}^- \rightarrow \text{Na}$

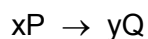
13 An energy profile diagram is shown.



What does the arrow R on the diagram represent?

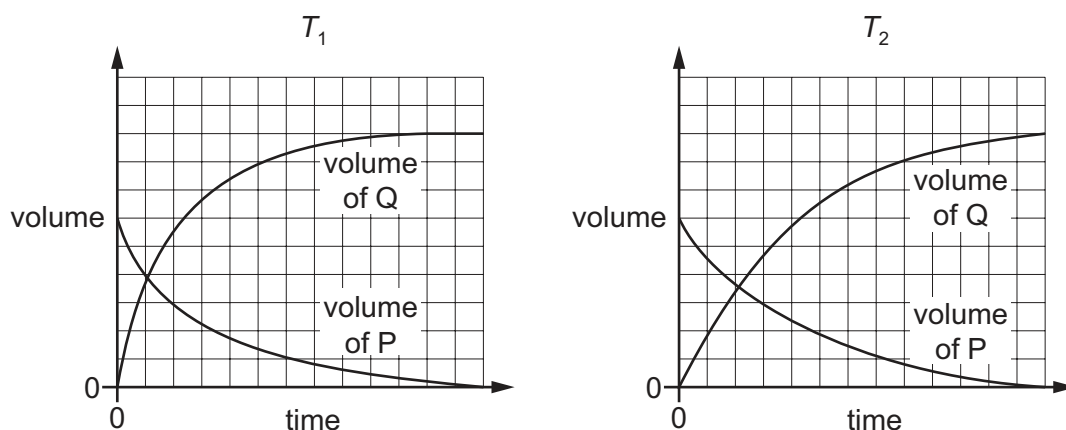
- A an endothermic energy change
 - B the activation energy
 - C the energy taken in by the reactants
 - D the enthalpy change of the reaction
- 14 Which statement about exothermic and endothermic reactions is correct?
- A In an endothermic reaction, energy is used to break bonds but no energy is released when bonds form.
 - B In an endothermic reaction, energy is released when bonds form but more energy is used to break bonds.
 - C In an exothermic reaction, energy is released both by breaking and by forming bonds.
 - D In an exothermic reaction, energy is released when bonds form but no energy is needed to break bonds.

15 Gas P decomposes to form gas Q.



Two experiments are carried out to investigate the rate of reaction. The conditions are the same except that two different temperatures, T_1 and T_2 , are used.

The results are plotted on graphs, drawn to the same scale.



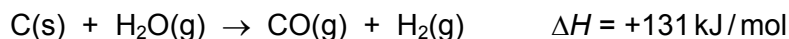
Which row is correct?

	x	y	temperature
A	2	3	T_1 is higher than T_2
B	2	3	T_2 is higher than T_1
C	3	2	T_1 is higher than T_2
D	3	2	T_2 is higher than T_1

16 In which reaction is the underlined substance reduced?

- A** C(s) + CO₂(g) → 2CO(g)
- B** Cl₂(g) + 2I⁻(aq) → I₂(aq) + 2Cl⁻(aq)
- C** Mg(s) + CuO(s) → MgO(s) + Cu(s)
- D** Zn(s) + 2H⁺(aq) → Zn²⁺(aq) + H₂(g)

17 The equation for an industrial process is shown.



Which row is correct?

	the oxidising agent is	the reducing agent is	the reaction is
A	C(s)	H ₂ O(g)	endothermic
B	C(s)	H ₂ O(g)	exothermic
C	H ₂ O(g)	C(s)	endothermic
D	H ₂ O(g)	C(s)	exothermic

18 Sodium hydroxide is added to a solution to alter its pH. A neutral solution is formed.

Which statement is correct?

- A** Sodium hydroxide is an acid and reacts with an alkali to form water as a product.
- B** Sodium hydroxide will lower the pH of the solution.
- C** The pH of the neutral solution is 14.
- D** The pH of the solution before sodium hydroxide is added is below 7.

19 Sodium chloride is dissolved in distilled water. Universal indicator is added to the solution.

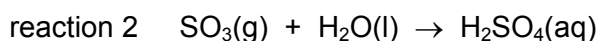
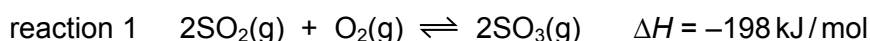
What is the colour of the universal indicator?

- A** blue (weak alkali)
- B** green (neutral)
- C** purple (strong alkali)
- D** red (acidic)

20 Which statement about ammonia is correct?

- A** It is a colourless, odourless gas.
- B** It is a gas that turns damp blue litmus paper red.
- C** It is formed when potassium nitrate is heated with aqueous sodium hydroxide and aluminium.
- D** It is manufactured using vanadium(V) oxide as a catalyst.

- 21 Which statement gives reasons why ammonium sulfate can be used as a fertiliser?
- A It contains nitrogen and phosphorous which are essential constituents of plant protein.
 - B It contains nitrogen to promote plant growth and is soluble in water.
 - C It contains sulfate ions which changes the pH of the soil.
 - D It contains sulfate ions and forms ammonia when lime is added to the soil.
- 22 Sulfuric acid is manufactured using the contact process. The equations for the reactions in the process are shown.



Which statements are correct?

- 1 Reaction 1 is reversible.
- 2 Reaction 1 is exothermic.
- 3 In reaction 2, sulfur dioxide reacts with water to form sulfuric acid.

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

- 23 Three statements about the elements carbon, nitrogen and sulfur are shown.
- 1 They are in groups next to each other in the Periodic Table.
 - 2 Their neutron to proton ratios are all two to one.
 - 3 They each form an acidic oxide.

Which statements are correct?

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

- 24 What is a property of halogens?
- A Their atoms decrease in size down the group.
 - B Their melting points increase down the group.
 - C They conduct electricity when molten.
 - D Their silver salts are all soluble in water.

- 25 Part of the Periodic Table shows the positions of four elements. These are **not** the elements' actual symbols.

Which element has a high melting point and a variable oxidation state?

- 26 Brass is made from copper and zinc. It has many uses.

Brass is1..... of these two elements.

Brass is used in electrical plugs because it is an electrical2..... .

Which words correctly complete gaps 1 and 2?

	1	2
A	an alloy	conductor
B	an alloy	insulator
C	a compound	conductor
D	a compound	insulator

- 27 Metal carbonates decompose when heated.

Which carbonate is most stable to heat?

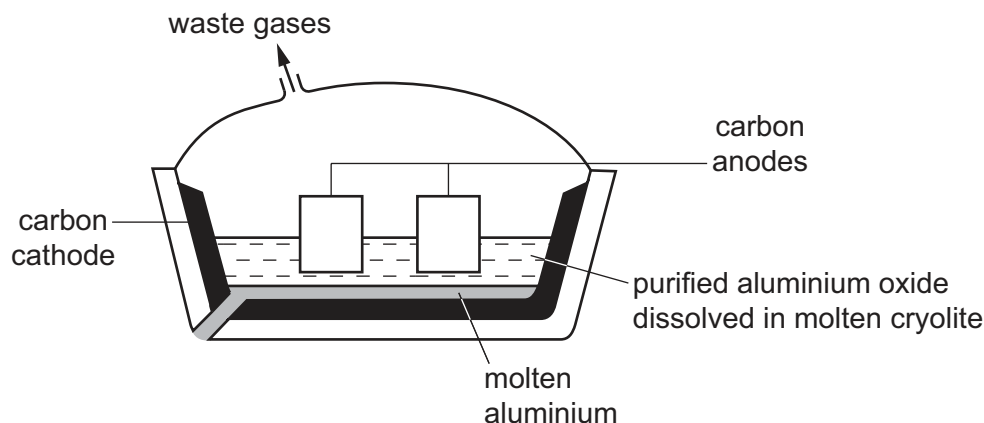
- A** calcium carbonate
- B** copper(II) carbonate
- C** lead(II) carbonate
- D** zinc carbonate

- 28 Tin is a metal between iron and lead in the reactivity series.

Which method is used for the extraction of tin from its ores?

- A** electrolysis of the molten ore
- B** heat alone
- C** heat with aluminium powder
- D** heat with carbon

29 Aluminium is extracted from aluminium oxide by electrolysis.



Which statement about this electrolysis is correct?

- A Aluminium ions gain electrons to form aluminium.
- B Cryolite increases the melting point of the electrolyte.
- C Cryolite reacts with impurities to form slag.
- D The carbon cathode has to be replaced regularly as it reacts with oxygen.

30 Methane and sulfur dioxide are two air pollutants found in the Earth's atmosphere.

Which row correctly identifies one source of each gas?

	one source of methane	one source of sulfur dioxide
A	decaying plants	photochemical reactions
B	decaying plants	volcanoes
C	lightning activity	photochemical reactions
D	lightning activity	volcanoes

31 The water supply can be purified by filtration and chlorination.

Which substance remains in the water supply after these treatments?

- A fine sand
- B harmful microbes
- C mineral salts
- D solid organic matter

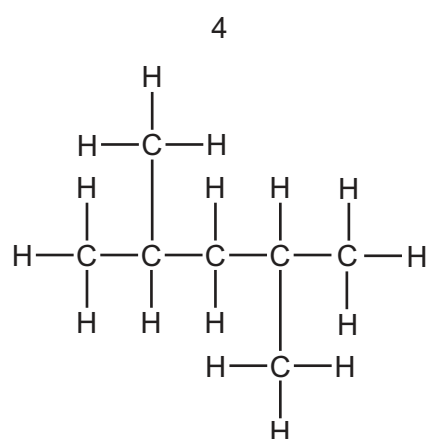
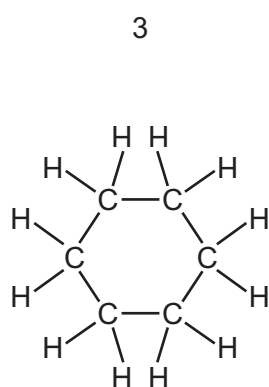
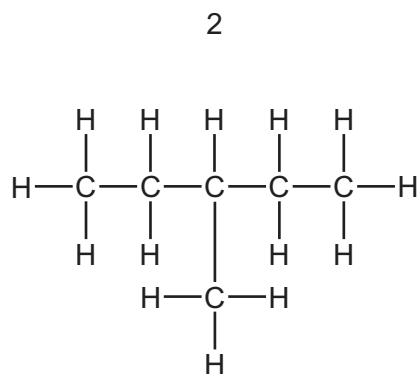
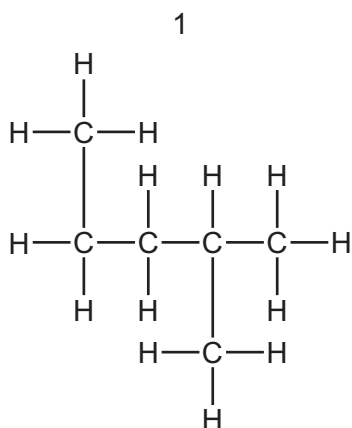
32 Which statements are true for homologous series?

- 1 Each series contains saturated compounds.
- 2 The compounds in each series are unreactive.
- 3 Each series has a general formula.
- 4 Each series has a gradation in physical properties.

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

33 Alkanes are saturated compounds containing carbon and hydrogen only.

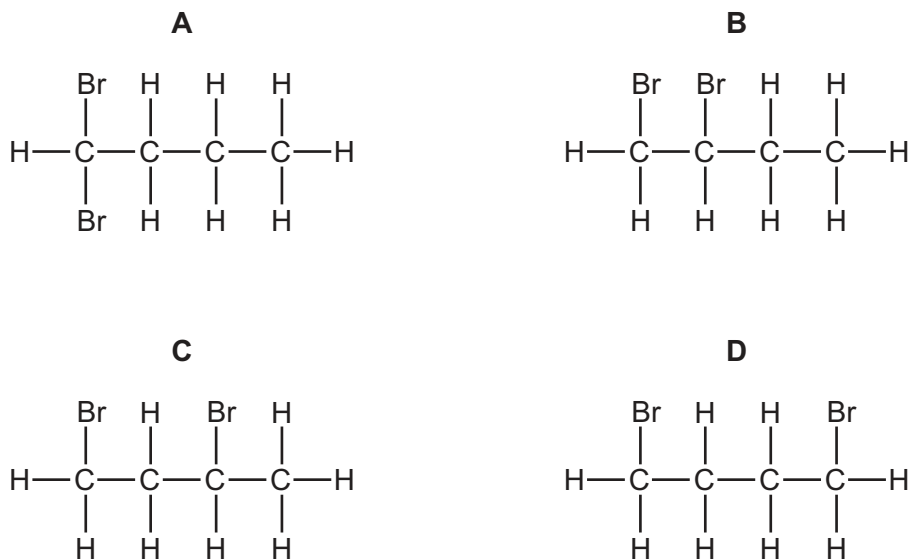
Structures 1, 2, 3 and 4 are saturated hydrocarbons.



Which pair of structures are isomers?

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

34 When butene reacts with bromine, which compound could be made?



35 How many structural isomers with the formula $\text{C}_4\text{H}_{10}\text{O}$ are alcohols?

- A** 2 **B** 3 **C** 4 **D** 5

36 Which statements about the alcohol $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ are correct?

- 1 When $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ is oxidised, it forms propanoic acid.
- 2 $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ burns in the air to form carbon dioxide and water.
- 3 $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ can be formed by the addition reaction between ethene and steam.

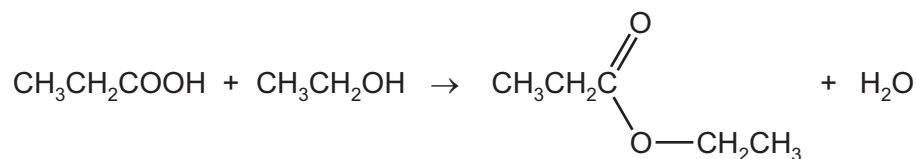
- A** 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3

37 Propanoic acid reacts with calcium carbonate. The products of this reaction are calcium propanoate, carbon dioxide and water.

What is the equation for this reaction?

- A** $2\text{C}_2\text{H}_5\text{COOH} + \text{Ca}_2\text{CO}_3 \rightarrow 2\text{C}_2\text{H}_5\text{COOCa} + \text{CO}_2 + \text{H}_2\text{O}$
- B** $2\text{C}_2\text{H}_5\text{COOH} + \text{CaCO}_3 \rightarrow (\text{C}_2\text{H}_5\text{COO})_2\text{Ca} + \text{CO}_2 + \text{H}_2\text{O}$
- C** $2\text{C}_3\text{H}_7\text{COOH} + \text{Ca}_2\text{CO}_3 \rightarrow 2\text{C}_3\text{H}_7\text{COOCa} + \text{CO}_2 + \text{H}_2\text{O}$
- D** $2\text{C}_3\text{H}_7\text{COOH} + \text{CaCO}_3 \rightarrow (\text{C}_3\text{H}_7\text{COO})_2\text{Ca} + \text{CO}_2 + \text{H}_2\text{O}$

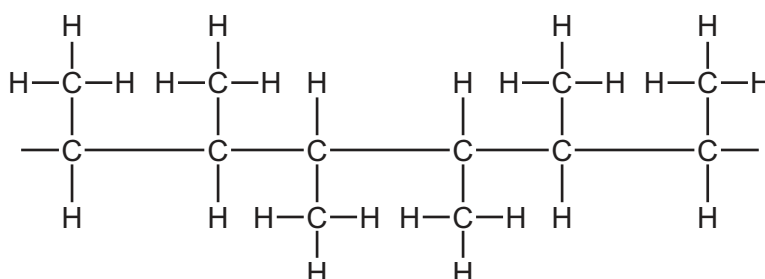
38 An acid reacts with an alcohol to form an ester and water.



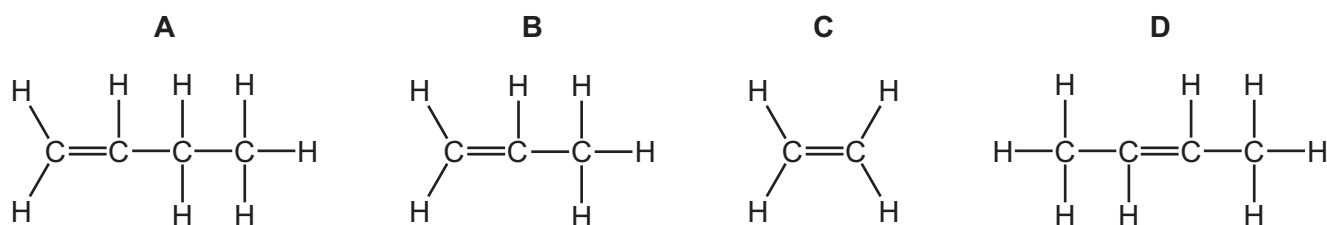
What is the name of the ester formed in this reaction?

- A ethyl ethanoate
- B ethyl propanoate
- C propyl ethanoate
- D propyl propanoate

39 Part of a polymer chain is shown.



Which monomer was used to produce this polymer?



40 Which statement about polymers is correct?

- A Fats and nylons all contain the $\text{—}\overset{\text{O}}{\parallel}{\text{C}}\text{—O—}$ linkage.
- B Monomers used in condensation polymerisation must contain both $\text{—CO}_2\text{H}$ and —OH groups.
- C Poly(ethene) will decolourise bromine.

- D Proteins with the $\text{—}\overset{\text{O}}{\parallel}{\text{C}}\text{—N—}$ linkage are biodegradable as they can be hydrolysed.

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The Periodic Table of Elements

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3 Li lithium 7	4 Be beryllium 9	11 Na sodium 23	12 Mg magnesium 24	<table border="1"> <thead> <tr> <th colspan="2">Key</th> </tr> <tr> <th>atomic number</th> <th>atomic symbol name relative atomic mass</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>H hydrogen 1</td> </tr> </tbody> </table>										Key		atomic number	atomic symbol name relative atomic mass	1	H hydrogen 1	2 He helium 4																																																																																																																																																																																
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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 —	118 Og oganesson —	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 —

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.).