Cambridge
O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

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

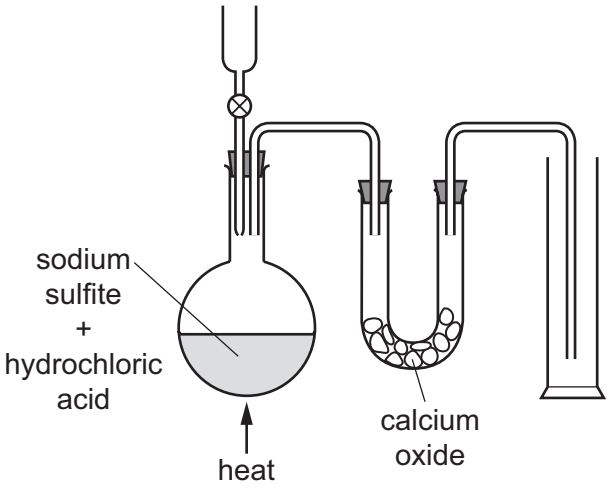
C nitrogen, oxygen, fluorine

D oxygen, chlorine, helium

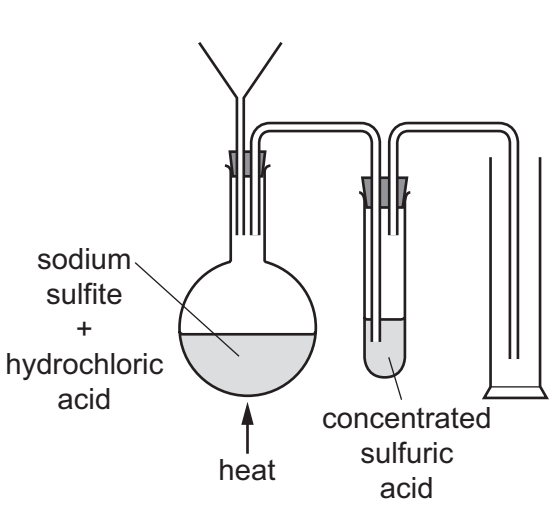
5 Sulfur dioxide is a gas that is prepared by heating sodium sulfite with hydrochloric acid. It is an acidic gas. Sulfur dioxide is more dense than air.

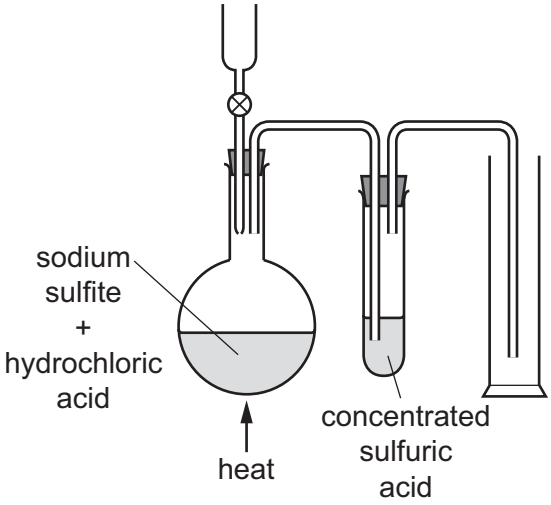
Which set of apparatus is suitable for preparing and collecting a dry sample of sulfur dioxide?

A

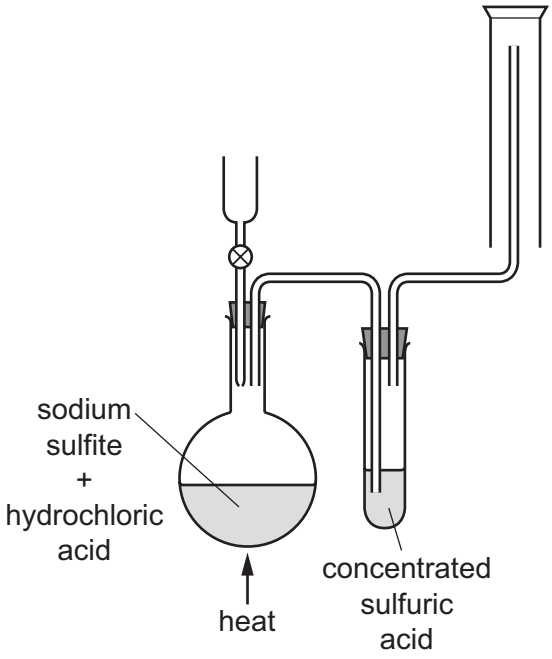


B





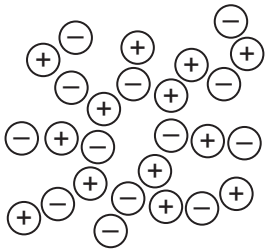
C



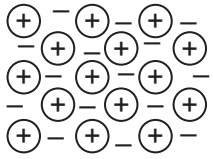
D

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

A



B



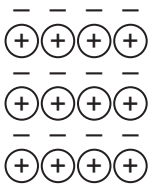
key

⊖ a negative ion

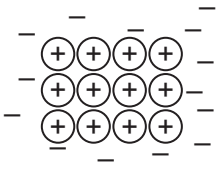
⊕ a positive ion

− an electron

C



D



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

$$2H_2S(g) + 3O_2(g) \rightarrow 2H_2O(g) + 2SO_2(g)$$

48 dm^3 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 dm^3 **B** 36 dm^3 **C** 48 dm^3 **D** 96 dm^3

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

	CH_2	C_2H_4	C_nH_{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.

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

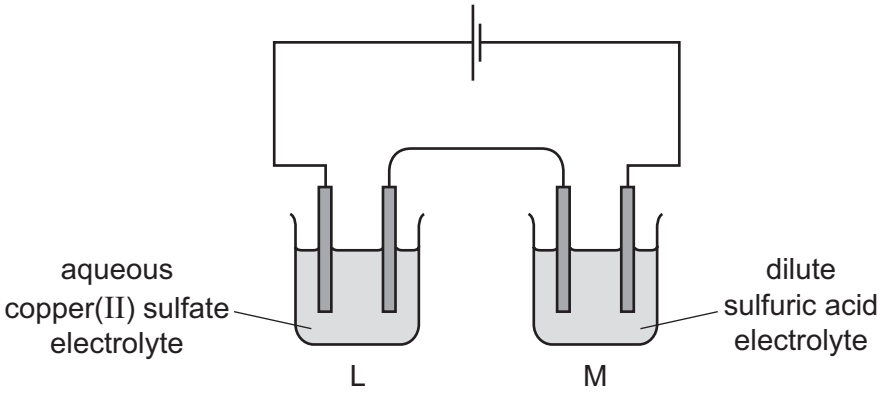
What is the percentage yield when 60 kg of ammonia is produced from 60 kg of hydrogen?

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	✓	✗
C	✗	✓
D	✗	✗

key

✓ = concentration stays constant

✗ = concentration does not stay constant

12 Molten sodium chloride is electrolysed.

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

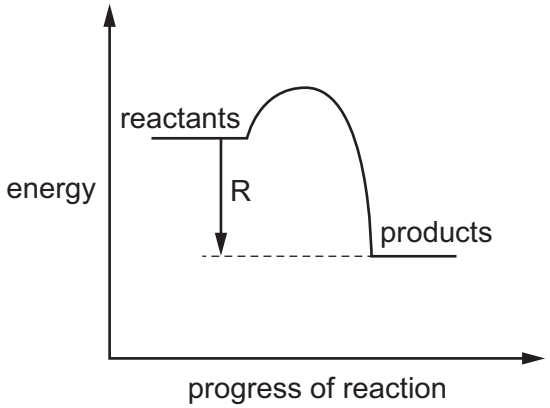
A $2Cl^- + 2e^- \rightarrow Cl_2$

B $2Cl^- - 2e^- \rightarrow Cl_2$

C $Na^+ + e^- \rightarrow Na$

D $Na^+ - e^- \rightarrow Na$

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.

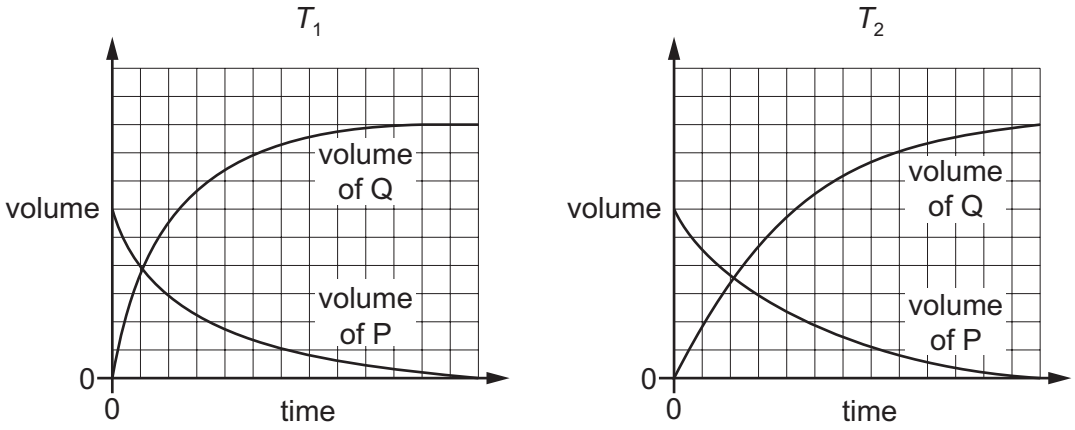
D In an exothermic reaction, energy is released when bonds form but no energy is needed to break bonds.

15 Gas P decomposes to form gas Q.

$$xP \rightarrow yQ$$

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 $\underline{C}(s) + CO_2(g) \rightarrow 2CO(g)$

B $\underline{Cl_2}(g) + 2I^-(aq) \rightarrow I_2(aq) + 2Cl^-(aq)$

C $\underline{Mg}(s) + CuO(s) \rightarrow MgO(s) + Cu(s)$

D $\underline{Zn}(s) + 2H^+(aq) \rightarrow Zn^{2+}(aq) + H_2(g)$

17 The equation for an industrial process is shown.

$$C(s) + H_2O(g) \rightarrow CO(g) + H_2(g) \qquad \Delta H = +131\,kJ/mol$$

Which row is correct?

	the oxidising agent is	the reducing agent is	the reaction is
A	C(s)	$H_2O(g)$	endothermic
B	C(s)	$H_2O(g)$	exothermic
C	$H_2O(g)$	C(s)	endothermic
D	$H_2O(g)$	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.

reaction 1 $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ $\Delta H = -198\,kJ/mol$

reaction 2 $SO_3(g) + H_2O(l) \rightarrow H_2SO_4(aq)$

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.

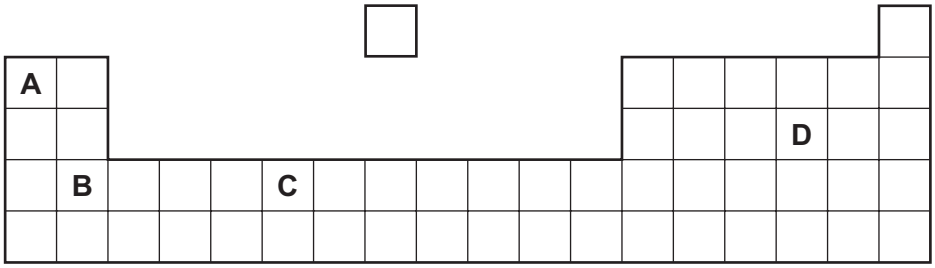
B Their melting points increase down the group.

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 is .....1..... of these two elements.

Brass is used in electrical plugs because it is an electrical .....2..... .

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?

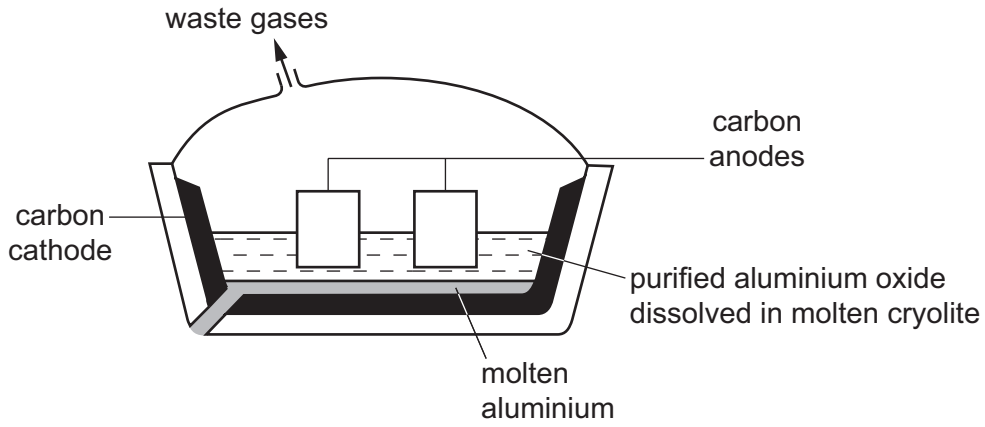
A electrolysis of the molten ore

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

[Turn over

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

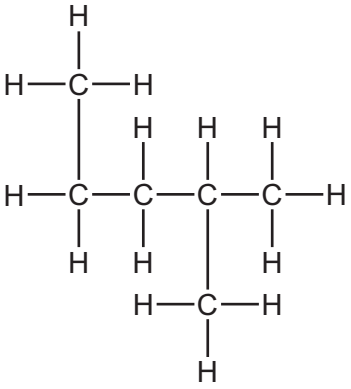
C 1 and 4 only

D 3 and 4 only

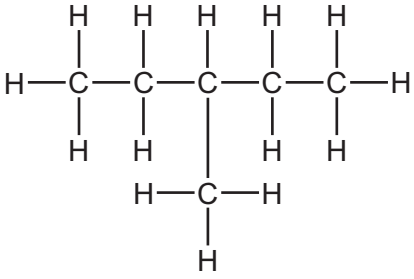
33 Alkanes are saturated compounds containing carbon and hydrogen only.

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

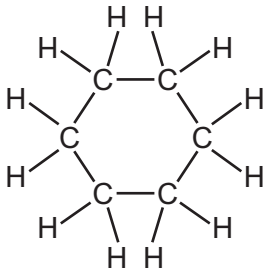
1



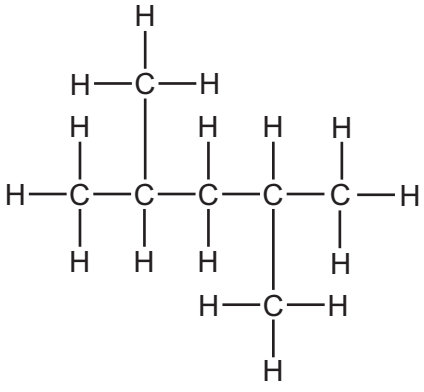
2



3



4

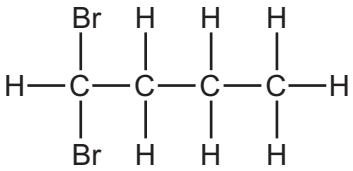


Which pair of structures are isomers?

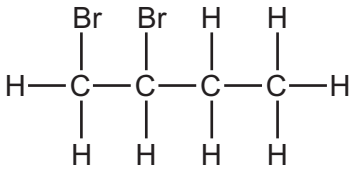
A 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

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

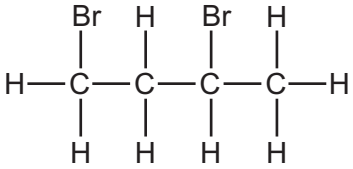
A



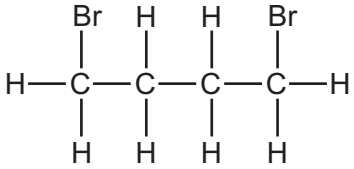
B



C



D



35 How many structural isomers with the formula $C_4H_{10}O$ are alcohols?

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

36 Which statements about the alcohol $CH_3CH_2CH_2OH$ are correct?

1 When $CH_3CH_2CH_2OH$ is oxidised, it forms propanoic acid.

2 $CH_3CH_2CH_2OH$ burns in the air to form carbon dioxide and water.

3 $CH_3CH_2CH_2OH$ 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?

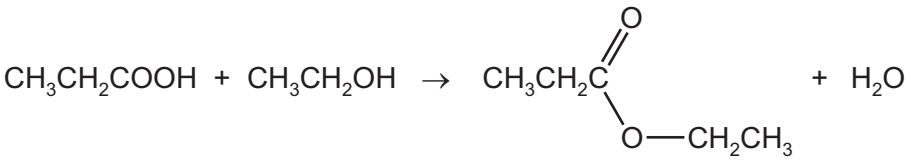
A $2C_2H_5COOH + Ca_2CO_3 \rightarrow 2C_2H_5COOCa + CO_2 + H_2O$

B $2C_2H_5COOH + CaCO_3 \rightarrow (C_2H_5COO)_2Ca + CO_2 + H_2O$

C $2C_3H_7COOH + Ca_2CO_3 \rightarrow 2C_3H_7COOCa + CO_2 + H_2O$

D $2C_3H_7COOH + CaCO_3 \rightarrow (C_3H_7COO)_2Ca + CO_2 + H_2O$

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



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

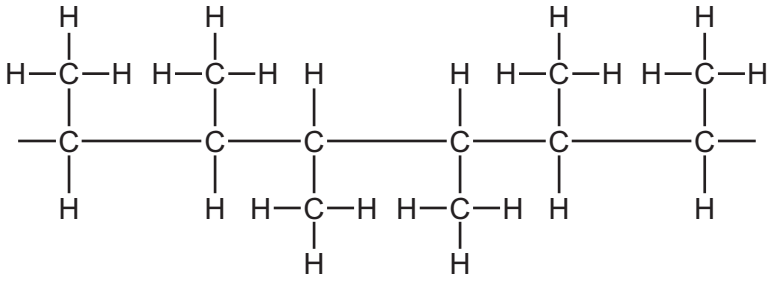
A ethyl ethanoate

B ethyl propanoate

C propyl ethanoate

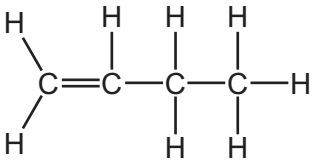
D propyl propanoate

39 Part of a polymer chain is shown.

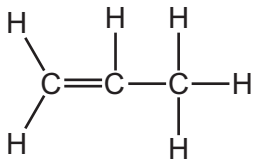


Which monomer was used to produce this polymer?

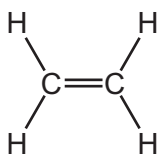
A



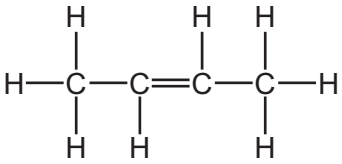
B



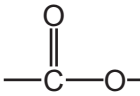
C



D

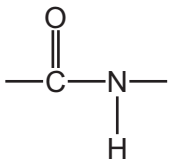


40 Which statement about polymers is correct?

A Fats and nylons all contain the  linkage.

B Monomers used in condensation polymerisation must contain both $–CO_2H$ and –OH groups.

C Poly(ethene) will decolourise bromine.

D Proteins with the  linkage are biodegradable as they can be hydrolysed.

BLANK PAGE

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.).