

Name:	Class:	Class Register Number:
-------	--------	------------------------



中正中学

CHUNG CHENG HIGH SCHOOL (MAIN)

Chung Cheng High School Chung Cheng High School Chung Cheng High School Chung Cheng High School Chung Cheng High School
Chung Cheng High School Chung Cheng High School Chung Cheng High School Chung Cheng High School Chung Cheng High School
Chung Cheng High School Chung Cheng High School Chung Cheng High School Chung Cheng High School Chung Cheng High School
Chung Cheng High School Chung Cheng High School Chung Cheng High School Chung Cheng High School Chung Cheng High School
Chung Cheng High School Chung Cheng High School Chung Cheng High School Chung Cheng High School Chung Cheng High School

Parent's Signature

PRELIMINARY EXAMINATION 2022
SECONDARY 4

CHEMISTRY

6092/01

Paper 1 Multiple Choice

16 September 2022

1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluid.

Write your name, class and register number clearly in the spaces provided at the top of this page.

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 18.

The use of an approved scientific calculator is expected, where appropriate.

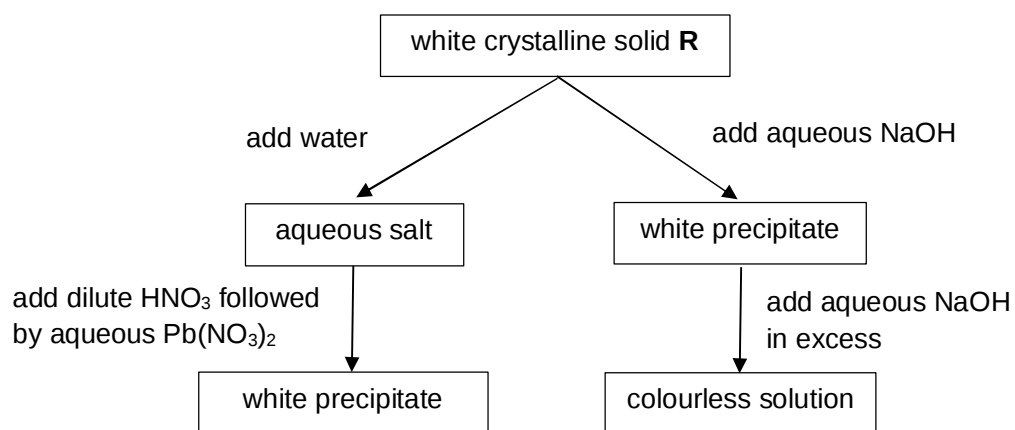
This document consists of **18** printed pages.

[Turn over

1 Which mixture can be separated into its components by adding water, stirring and filtering?

- A ammonium carbonate and sodium chloride
- B calcium nitrate and barium chloride
- C iron(II) carbonate and potassium sulfate
- D copper and sulfur

2 The diagram below shows the reaction of an unknown substance.



What is solid **R**?

- A zinc chloride
- B sodium carbonate
- C aluminium nitrate
- D calcium sulfate

- 3 The following reactions are carried out.

reaction	result
propanoic acid is added to ammonium carbonate	gas E is given off
ammonium propanoate is warmed with aqueous sodium hydroxide	gas F is given off
propanoic acid is added to aqueous ammonia	compound G is formed in a colourless solution

What are **E**, **F** and **G**?

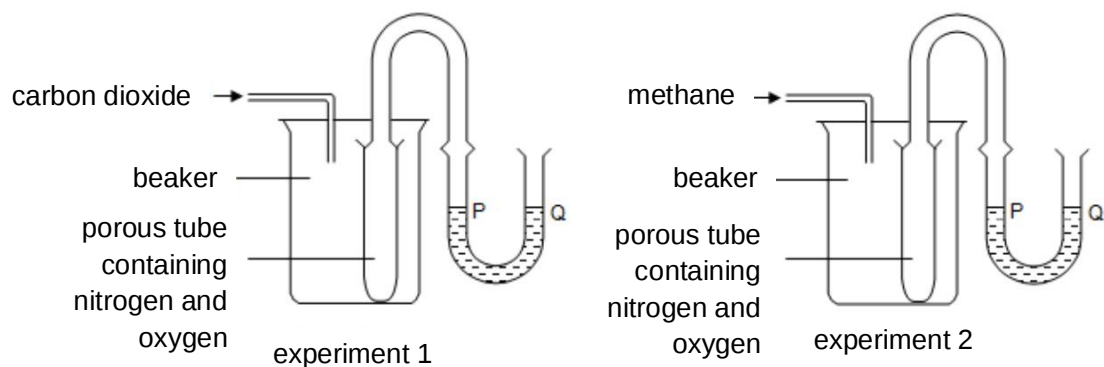
	<u>gas E</u>	<u>gas F</u>	<u>compound G</u>
A	ammonia	carbon dioxide	ammonium carbonate
B	ammonia	carbon dioxide	ammonium propanoate
C	carbon dioxide	ammonia	ammonium carbonate
D	carbon dioxide	ammonia	ammonium propanoate

- 4 In which of the following substances are the particles closest to one another at 25 °C?

- A** dilute hydrochloric acid
- B** copper(II) oxide
- C** ethanol
- D** carbon monoxide

[Turn over

- 5 Two experimental set-ups to demonstrate the diffusion of gases are shown in the diagram below.



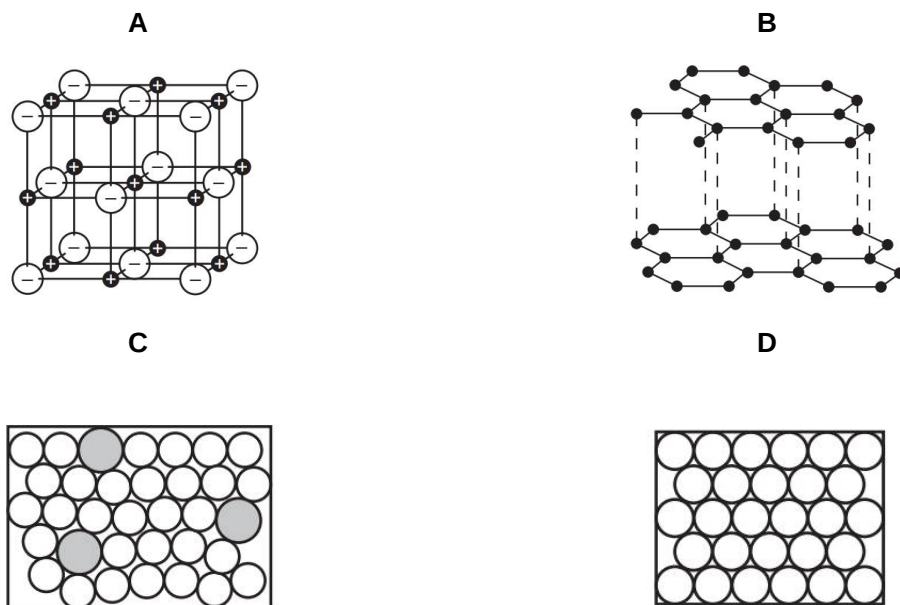
What changes, if any, to the water levels at P and Q would you expect to see in both experiments?

	<u>experiment 1</u>	<u>experiment 2</u>
A	P and Q remain the same	Q is higher than P
B	P and Q remain the same	P is higher than Q
C	Q is higher than P	P is higher than Q
D	P is higher than Q	Q is higher than P

- 6 Which statements comparing the properties of electrons, neutrons and protons are correct?

	neutrons and protons are both heavier than electrons	only electrons and neutrons are charged
A	yes	yes
B	yes	no
C	no	yes
D	no	no

- 7 Which diagram best shows the structure of a mixture?



- 8 Sodium nitrate is an ionic compound.

Which statement is **not** correct?

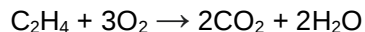
- A Cations are formed when sodium atoms lose electrons.
 - B The oppositely charged ions are held strongly together.
 - C Nitrate ion is a positively charged polyatomic ion.
 - D Sodium nitrate solution can conduct electricity.
- 9 In the molecules CH_3OH , NH_3 and HF , which atoms use all of their outer shell electrons in bonding?
- A C and H
 - B C and F
 - C N and H
 - D H and O

- 10** Element Q has a proton number 3.
Element R has an electronic configuration 2,8,6.

What would be the formula of the compound formed between Q and R?

- A** QR **B** Q₂R **C** QR₂ **D** QR₄

- 11** 15 cm³ of ethene reacts with 60 cm³ of oxygen at 150 °C in a reaction vessel according to the equation below.



What is the total volume of gases at the end of the reaction in the reaction vessel?

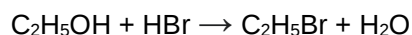
- A** 30 cm³
B 60 cm³
C 75 cm³
D 110 cm³

- 12** 20 cm³ of an aqueous 1.0 mol/dm³ solution of the hydroxide of metal X exactly neutralises 40 cm³ of 0.25 mol/dm³ dilute sulfuric acid.

What is the formula for the sulfate of X?

- A** XSO₄ **B** X(SO₄)₂ **C** X₂SO₄ **D** X₂(SO₄)₃

- 13** In a reaction between 23 g of ethanol and excess hydrogen bromide, the mass of bromoethane obtained is 27 g.



What is the percentage yield of bromoethane?

[Mr: C₂H₅OH, 46; C₂H₅Br, 109]

- A** 25% **B** 50% **C** 60% **D** 85%

- 14** 2 g of an impure zinc oxide reacts with excess nitric acid to produce 3.97 g of zinc nitrate.

What is the percentage purity of zinc oxide used?

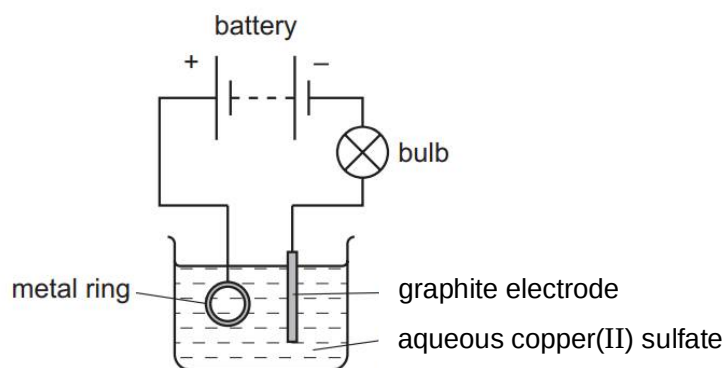
- A** 50% **B** 79% **C** 82% **D** 85%

- 15** In an electrolysis experiment, the same amount of charge deposited 68.9 g of silver and 6.64 g of chromium.

What is the charge on the chromium ion?

- A** +2 **B** +3 **C** +5 **D** +6

- 16** The diagram below shows apparatus used in an attempt to electroplate a metal ring with copper.



The experiment did not work.

What change is needed in the experiment to make it work?

- A** Replace the graphite electrode with a copper electrode.
B Reverse the connections to the battery.
C Increase the temperature of the electrolyte.
D Add solid copper(II) sulfate to the electrolyte.

- 17** Four electrolysis cells are set up. Each cell has platinum electrodes.

These electrolytes are listed below.

cell 1: aqueous zinc nitrate

cell 2: dilute hydrochloric acid

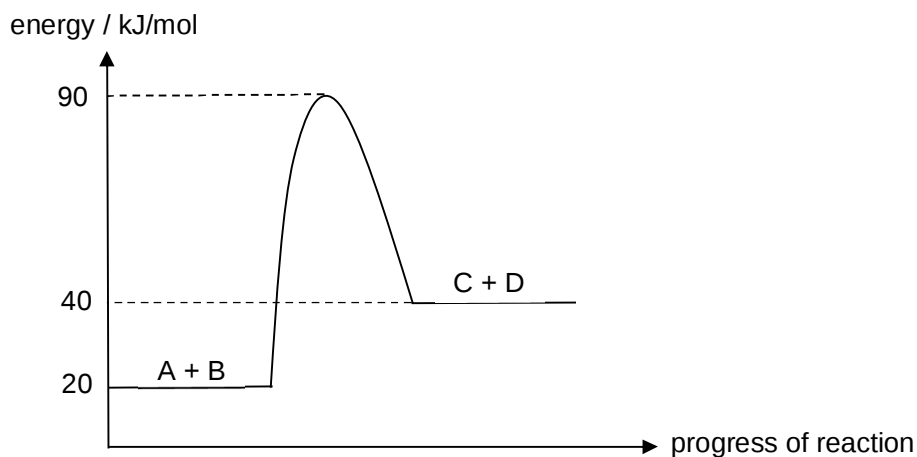
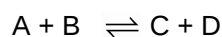
cell 3: molten sodium bromide

cell 4: concentrated copper(II) chloride

In which of these cells is a gas formed at both electrodes?

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

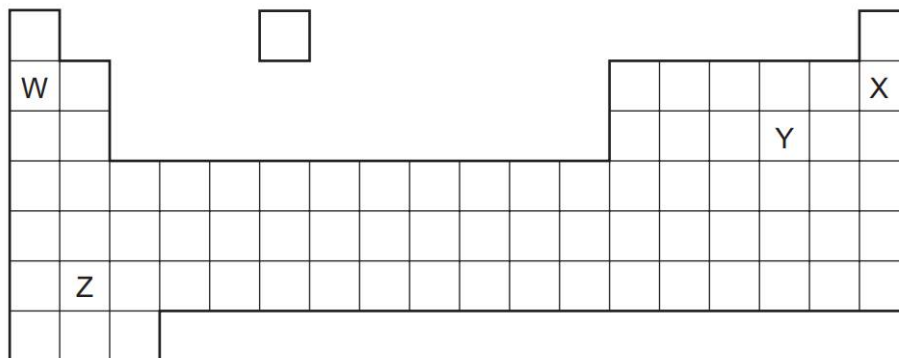
- 18** The energy profile diagram of a reversible reaction is shown below.



Which of the following statements is correct about the energy profile diagram?

- A** Activation energy of the backward reaction is given by -50 kJ/mol.
B Enthalpy change of the backward reaction is given by $+20$ kJ/mol.
C Activation energy of the forward reaction is given by $+70$ kJ/mol.
D Enthalpy change of the forward reaction is given by $+50$ kJ/mol.

- 19 Which one of the following is an endothermic process?
- A Mixing of dilute sulfuric acid with aqueous sodium hydroxide.
 - B Addition of lithium to cold water.
 - C Heating of zinc carbonate to get zinc oxide.
 - D Rusting of an iron nail.
- 20 Which of the underlined substance acts as a reducing agent?
- A Fe₂O₃ + 3CO → 2Fe + 3CO₂
 - B Br₂ + 2NaI → 2NaBr + I₂
 - C H₂O₂ + NaOCl → O₂ + NaCl + H₂O
 - D Cu(NO₃)₂ + Zn → Cu + Zn(NO₃)₂
- 21 Which of the following statements about an acid is correct?
- A pH is a measure of acid concentration in a solution.
 - B A weak acid can have the same pH as a strong acid.
 - C When an acid reacts with a reactive metal, hydrogen ions lose electrons.
 - D Universal indicator turns blue when placed in an acid.



A W and Z only **B** W only **C** X and Y only **D** Y only

What will be observed when the reaction is complete?

- A** a colourless solution only
- B** a green precipitate and a blue solution
- C** a green precipitate and a colourless solution
- D** a white precipitate and a colourless solution

24 Which is the best way to prepare calcium sulfate, starting from calcium carbonate?

- A** Add dilute sulfuric acid to calcium carbonate and then filter.
- B** Add excess aqueous sodium sulfate to calcium carbonate and then filter.
- C** Add excess nitric acid to calcium carbonate followed by dilute sulfuric acid and filter.
- D** Heat calcium carbonate and then react the calcium oxide with dilute sulfuric acid, then filter.

A A catalyst of iron is used.

B Hydrogen and nitrogen react in a 1:3 mole ratio to form two moles of ammonia.

C Hydrogen for the process can be obtained by the cracking of oil.

D The reaction will not give 100% yield in a closed container.

These letters are not the chemical symbols of the elements.

[illegible]

A L reacts more vigorously with water than does M.

B R has a more non-metallic character than T.

C M and R react together exothermically.

D L, M and Q are able to gain electrons to form anions.

halogen added	NaX	NaY	NaZ
X ₂		Y ₂ displaced	no visible reaction
Y ₂	no visible reaction		no visible reaction
Z ₂	X ₂ displaced	Y ₂ displaced	

A Y, X, Z
B Y, Z, X
C X, Y, Z
D Z, X, Y

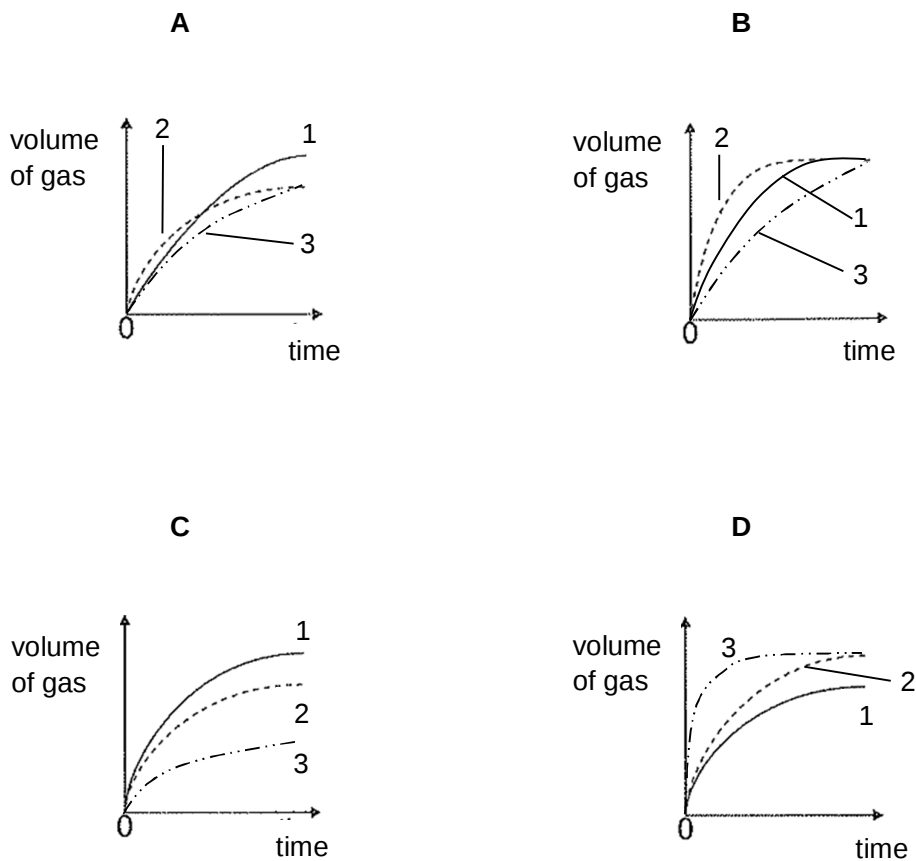
- 28 Three experiments are carried out to measure the volume of carbon dioxide produced when different concentrations of hydrochloric acid and ethanoic acid are added to excess calcium carbonate.

experiment	acid
1	50 cm ³ of 0.20 mol/dm ³ hydrochloric acid
2	20 cm ³ of 0.50 mol/dm ³ hydrochloric acid
3	50 cm ³ of 0.20 mol/dm ³ ethanoic acid

A graph of volume of carbon dioxide against time is plotted for all the experiments.

Which graph best shows the results for these experiments?

plot for experiment 1: —————
 plot for experiment 2: - - - - -
 plot for experiment 3: - · - · - · -



- 29** M is a metal. It can occur naturally as an element and sometimes in ore containing its oxides. M does not react with water and acid. M can be used to make a chloride with formula MCl or MCl_2 .

A student made some statements about metal M.

- 1 It can be extracted by electrolysis.
- 2 It is likely to be displaced from its solution containing its ions by silver.
- 3 It can be extracted from its ore by hydrogen.
- 4 It is likely to be found as an ore containing the compound M_2O or MO .

Which statements are correct?

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

- 30** A student made the following statements about some air pollutants.

1	Carbon monoxide is responsible for the production of acid rain.
2	Oxides of nitrogen are present in car exhausts.
3	Sulfur dioxide can be produced by the combustion of fossil fuels.
4	Methane causes global warming.

Which statements are correct?

- A** 1 and 2 only
B 3 and 4 only
C 2, 3 and 4 only
D all of the above

- 31** When crude oil is fractionally distilled, which compounds leave from the bottom of the fractionating column?

- A** The compounds that are least flammable.
B The compounds that are the least viscous.
C The compounds with the lowest relative molecular mass.
D The compounds with the lowest boiling points.

[Turn over

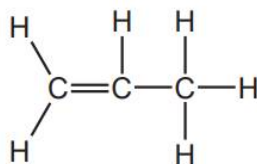
- 32 Which fraction from the fractional distillation of crude oil is **not** correctly matched to its use?

	<u>fraction</u>	<u>use</u>
A	bitumen	make road surfaces
B	paraffin	make polishes and waxes
C	kerosene	fuel for aircraft
D	naphtha	feedstock for plastics production

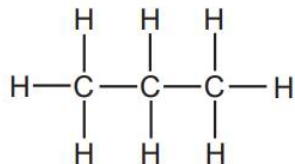
- 33 Alkanes, alkenes and alcohols are three types of organic compound.

Which structure does not belong to any of these three types of compound?

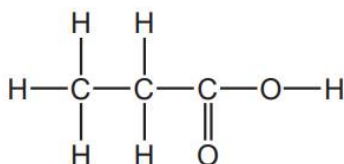
A



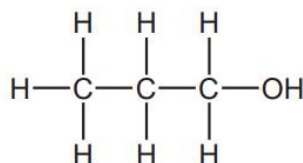
B



C



D

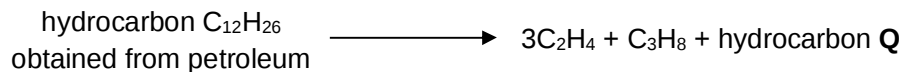


- 34 An organic compound X has the molecular formula $C_{20}H_{33}OH$.

How many carbon-carbon double bonds are present in a molecule of X?

- A 0 B 2 C 4 D 8

- 35** A hydrocarbon $C_{12}H_{26}$ obtained from petroleum can undergo cracking to give three hydrocarbons.



Which row best describes the molecules in hydrocarbon **Q** and the effect of **Q** on aqueous bromine?

	number of carbon atoms in Q molecule	effect of Q on aqueous bromine
A	3	decolourises
B	3	no effect
C	7	decolourises
D	7	no effect

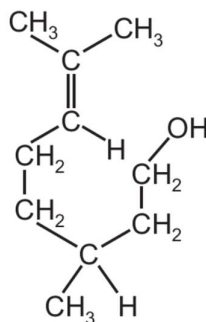
- 36** Ethanol can be formed by
- 1 fermentation
 - 2 reaction between steam and ethene

Which of these processes uses a catalyst?

	1	2
A	yes	yes
B	yes	no
C	no	yes
D	no	no

- 37 Citronellol is found in rose oil.

The structure of citronellol is shown.

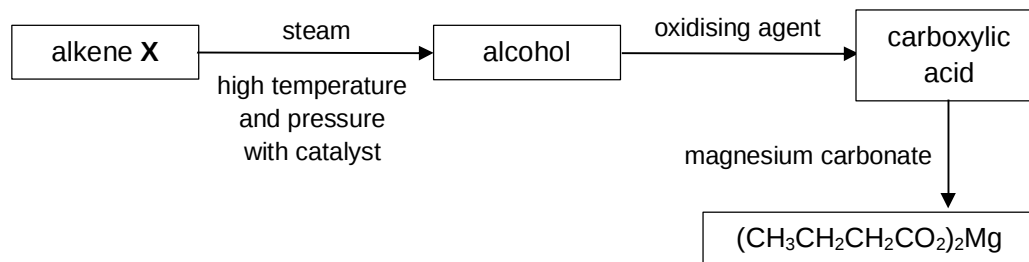


Which statement about citronellol is **not** correct?

- A Citronellol dissolves in water to give an alkaline solution.
 - B Citronellol turns purple acidified potassium manganate(VII) colourless.
 - C Citronellol reacts with hydrogen in the presence of a catalyst to give a saturated compound.
 - D Citronellol forms a polymer with the same empirical formula as the monomer.
- 38 The reaction between a carboxylic acid, $C_xH_yCO_2H$ and an alcohol, $C_nH_{2n+1}OH$, produces an ester.

How many hydrogen atoms does one molecule of ester contain?

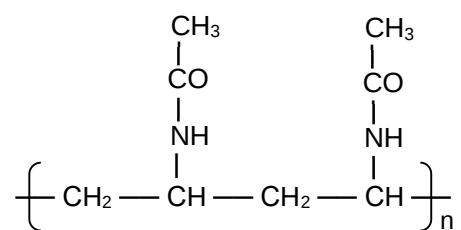
- A $y + 2n + 3$ B $y + 2n + 2$ C $y + 2n + 1$ D $y + 2n$
- 39 A reaction scheme for an alkene **X** is given. The alkene underwent a series of reactions to obtain the salt, $(CH_3CH_2CH_2CO_2)_2Mg$.



What was alkene **X**?

- A $CH_3CH=CH_2$
- B $CH_3CH_2CH=CH_2$
- C $CH_3CH=CHCH_3$
- D $CH_3CH_2CH_2CH=CH_2$

- 40 The diagram shows the formula of a polymer.



Which of the following could be used to make this polymer?

- A $\text{CH}_3 - \text{CO} - \text{CH} = \text{CH}_2$
- B CH_3COOH and $\text{H}_2\text{N} - \text{CH}_2 - \text{CH}_2 - \text{NH}_2$
- C $\text{CH}_3 - \text{CO} - \text{NH} - \text{CH} = \text{CH}_2$
- D $\text{CH}_3\text{COOCH}_3$ and $\text{H}_2\text{N} - \text{CH}_2 - \text{CH}_2 - \text{NH}_2$

Group											
I	II	III					IV	V	VI	VII	0
		1 H hydrogen 1									
		Key									
		proton (atomic) number atomic symbol name relative atomic mass									
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					
11 Na sodium	12 Mg magnesium	13 Al aluminium	14 Si silicon	15 P phosphorus	16 S sulfur	17 Cl chlorine					
23	24	27	28	31	32	35.5					
19 K potassium 39	20 Ca calcium 40	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80					
37 Rb rubidium 85	38 Sr strontium 88	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127					
55 Cs caesium 133	56 Ba barium 137	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium	85 At astatine					
87 Fr francium	88 Ra radium		114 Fl flerovium		116 Lv livermorium	-					
-	-		-	-	-	-					

lanthanoids

actinoids

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

[illegible]