



# Cambridge O Level

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## CHEMISTRY

5070/11

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)

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### 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

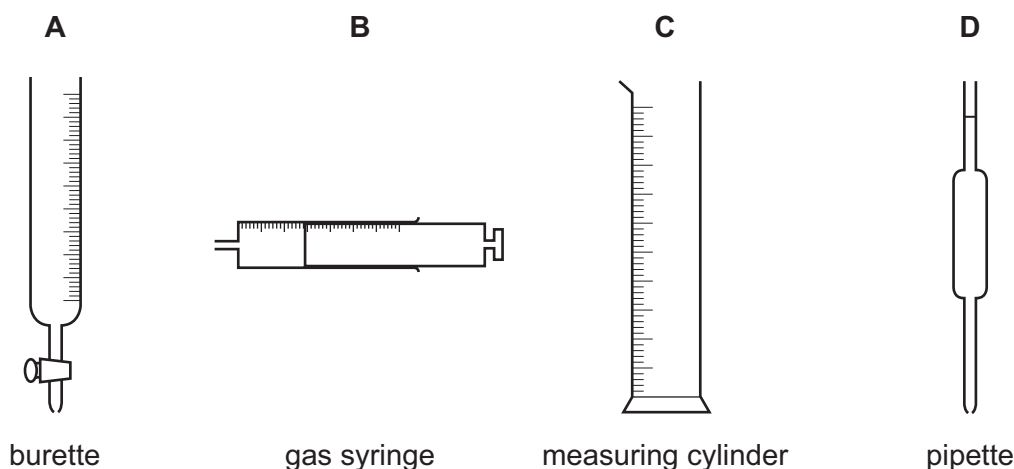
- The total mark for this paper is 40.
- Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

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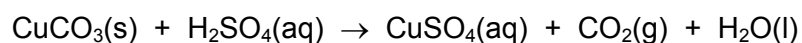
This document has **16** pages. Blank pages are indicated.

- 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 Copper(II) sulfate is prepared by reacting excess copper(II) carbonate with dilute sulfuric acid.

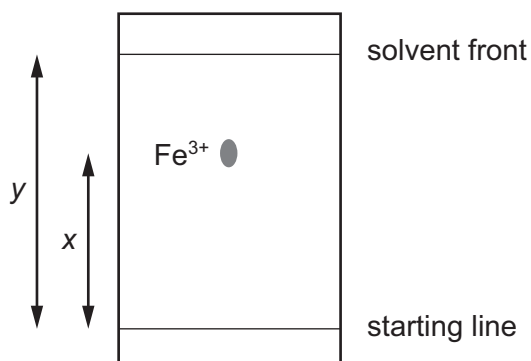


Which two pieces of apparatus are needed to obtain copper(II) sulfate crystals by this reaction?

- 1 thermometer
- 2 evaporating basin
- 3 filter funnel
- 4 gas syringe

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

- 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 by .....1..... and the colour of the precipitate is .....2..... .

Which row correctly completes gaps 1 and 2?

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

- 4 Aluminium chloride is dissolved in water and the resulting solution is divided between three test-tubes.

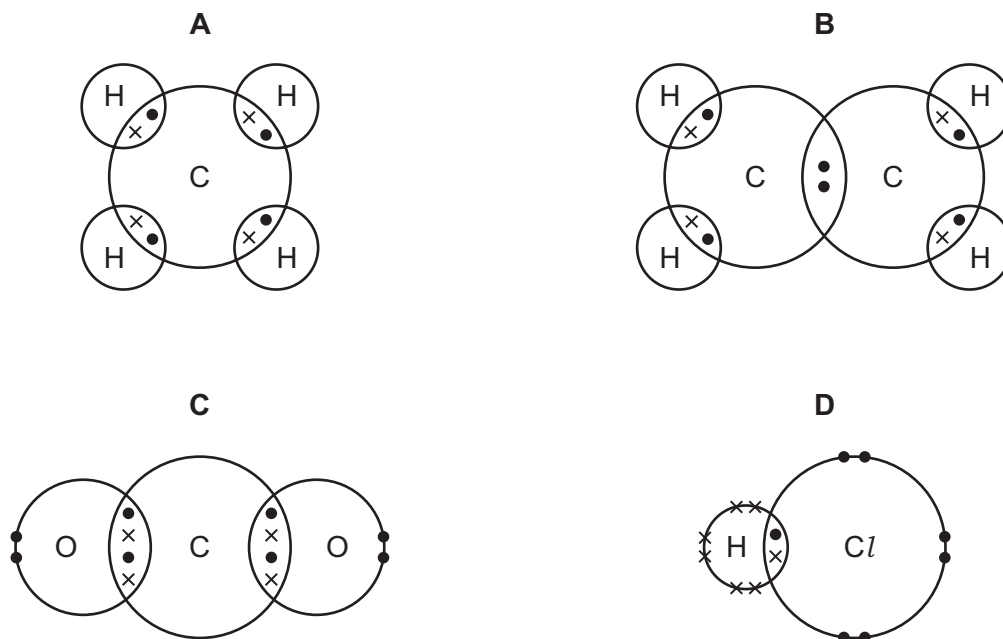
Which row gives the reagents for three tests which could be used to confirm the presence of aluminium chloride?

	test-tube 1	test-tube 2	test-tube 3
<b>A</b>	aqueous sodium hydroxide	aqueous ammonia	dilute hydrochloric acid and aqueous silver nitrate
<b>B</b>	aqueous sodium hydroxide	dilute nitric acid and aqueous silver nitrate	dilute hydrochloric acid
<b>C</b>	aqueous ammonia	dilute nitric acid and aqueous silver nitrate	nitric acid and barium nitrate
<b>D</b>	aqueous sodium hydroxide	aqueous ammonia	dilute nitric acid and aqueous silver nitrate

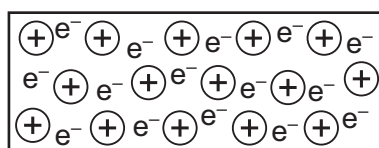
- 5 Which statement about methods of purification and analysis is correct?
- A A liquid that boils over a range of temperatures may still be 100% pure.
  - B An insoluble substance may be separated from water by crystallisation.
  - C Chromatography may only be used to separate coloured substances.
  - D Liquid air can be fractionally distilled, giving oxygen as one of the products.
- 6 Which changes in pressure and temperature would both result in a decrease in the volume of a fixed mass of gas?
- A Decrease the pressure and decrease the temperature.
  - B Decrease the pressure and increase the temperature.
  - C Increase the pressure and decrease the temperature.
  - D Increase the pressure and increase the temperature.
- 7 Which definition of isotopes is correct?
- A atoms of different elements which have the same number of electrons
  - B atoms of different elements which have the same number of neutrons
  - C atoms of the same element which have different numbers of electrons
  - D atoms of the same element which have different numbers of neutrons
- 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 Which substance is an ionic compound?
- A ammonia
  - B calcium chloride
  - C ethanoic acid
  - D hydrogen chloride

11 The dot-and-cross diagrams for four compounds are shown.

Which diagram is correct? (Note that only the outer shell electrons are shown.)



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



Which property will X have?

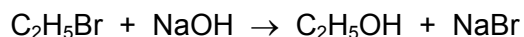
- A** It conducts electricity by the movement of ions and electrons.
- B** It has a high melting point.
- C** It is decomposed by an electric current.
- D** It is not malleable.

13 A chicken egg has a mass of 60 g. The egg shell is 10% of the total mass. The egg shell is made of calcium carbonate.

What is the mass of calcium in the egg shell?

- A** 0.24 g
- B** 0.40 g
- C** 2.4 g
- D** 4.0 g

- 14 Ethanol can be made by the reaction shown.



If 5.00 g of  $\text{C}_2\text{H}_5\text{Br}$  produces 1.59 g of ethanol, what is the **molar** percentage yield of ethanol?  
[ $M_r$ :  $\text{C}_2\text{H}_5\text{Br}$ , 109;  $\text{C}_2\text{H}_5\text{OH}$ , 46]

- A** 13%                      **B** 32%                      **C** 42%                      **D** 75%

- 15 An aqueous solution contains 0.01 mol of  $\text{Zn}^{2+}(\text{aq})$  and 0.01 mol of  $\text{Cu}^{2+}(\text{aq})$ .

Aqueous sodium hydroxide is added until in excess.

After shaking, the mixture is filtered.

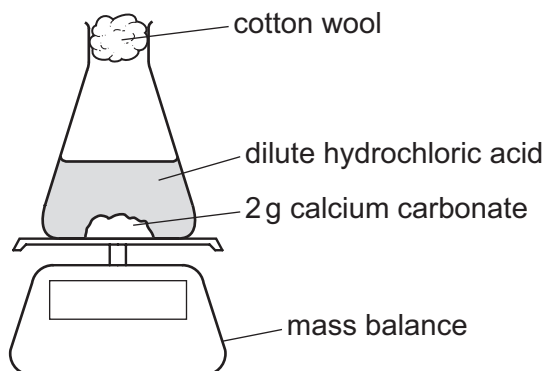
What remains on the filter paper?

- A** 0.01 mol of a white hydroxide and 0.01 mol of a blue hydroxide  
**B** 0.01 mol of a white hydroxide  
**C** 0.01 mol of a blue hydroxide  
**D** no solid residue

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

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

- 17 The rate of reaction between calcium carbonate and hydrochloric acid is measured in three separate experiments.

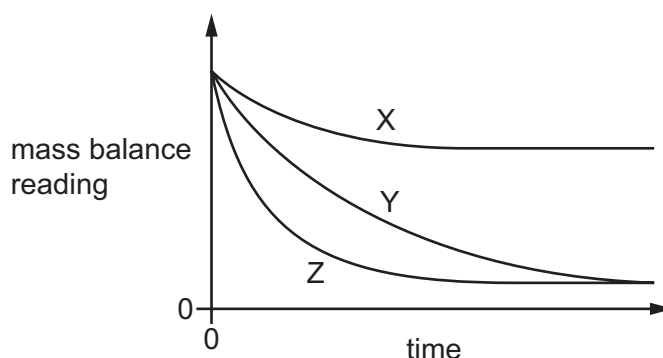


In experiment 1, the calcium carbonate is powdered and an excess of hydrochloric acid is used.

In experiment 2, the calcium carbonate is in lumps and an excess of hydrochloric acid is used.

In experiment 3, the calcium carbonate is in lumps but insufficient hydrochloric acid is used.

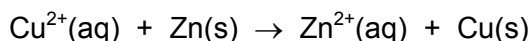
The results of these experiments are shown.



Which statement is correct?

- A Experiment 1 is shown by curve X.
- B Experiment 1 is shown by curve Y.
- C Experiment 2 is shown by curve Y.
- D Experiment 3 is shown by curve Z.

- 18 Pieces of zinc are added to aqueous copper(II) sulfate.



Which statement is correct?

- A  $\text{Cu}^{2+}(\text{aq})$  is oxidised to  $\text{Cu}(\text{s})$  by gaining electrons.
  - B  $\text{Cu}^{2+}(\text{aq})$  is reduced to  $\text{Cu}(\text{s})$  by losing electrons.
  - C  $\text{Zn}(\text{s})$  is oxidised to  $\text{Zn}^{2+}(\text{aq})$  by losing electrons.
  - D  $\text{Zn}(\text{s})$  is reduced to  $\text{Zn}^{2+}(\text{aq})$  by gaining electrons.
- 19 The oxide of element X reacts with acids to form salts.
- Which statement about element X or its oxide is correct?
- A X conducts electricity.
  - B X is a non-metal.
  - C The oxide is a gas at room temperature and pressure.
  - D The oxide is covalent.

- 20 Nitrogenous fertilisers promote plant growth and crop yield.

Which compound contains the greatest mass of nitrogen in 100 g of fertiliser?

- A  $\text{KNO}_3$
  - B  $\text{NH}_4\text{NO}_3$
  - C  $(\text{NH}_4)_2\text{SO}_4$
  - D  $(\text{NH}_4)_2\text{HPO}_4$
- 21 Which aqueous reagent liberates ammonia from ammonium nitrate on warming?
- A calcium nitrate
  - B potassium hydroxide
  - C sodium chloride
  - D sulfuric acid
- 22 Which statement about sulfuric acid is correct?
- A It is manufactured by heating hydrogen, oxygen and sulfur together.
  - B It is used as a battery acid.
  - C It is used as a detergent.
  - D It is used to neutralise alkaline soils.



**23** The diagram shows part of the Periodic Table.

Li																	
	Ca													Cl			

Which element has the highest proton number and which element has the largest number of valence electrons?

	highest proton number	highest number of valence electrons
<b>A</b>	Ca	Ca
<b>B</b>	Ca	Cl
<b>C</b>	Li	Ca
<b>D</b>	Li	Cl

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

During its reaction with water, X floats and melts.

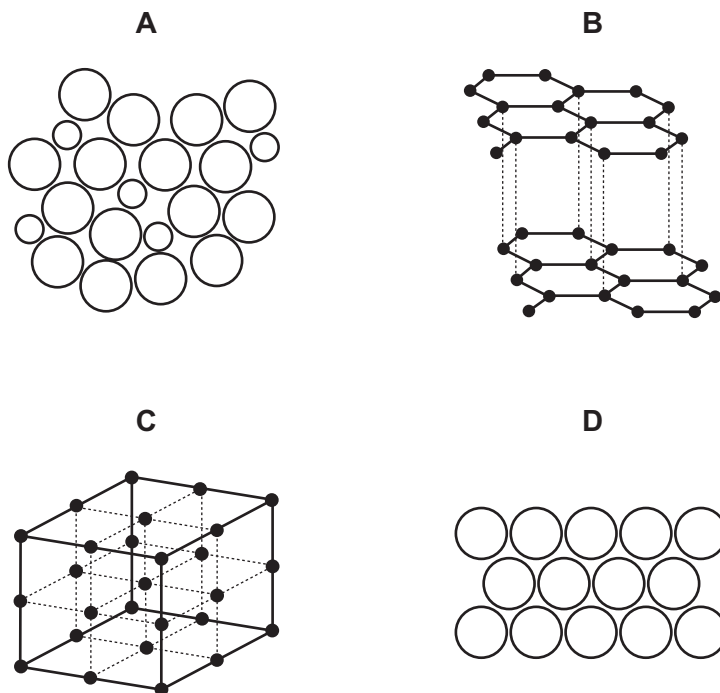
What is X?

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

**25** Which statement about the properties of some elements is correct?

- A** All noble gases are unreactive due to having eight electrons in their outer shells.
- B** The Group VII element astatine, At<sub>2</sub>, is expected to be a black solid at room temperature.
- C** The reactivity of the elements in both Group I and Group VII increases down the group.
- D** When aqueous chlorine is added to aqueous potassium bromide there is no change in colour.

26 Which diagram shows the structure of an alloy?



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

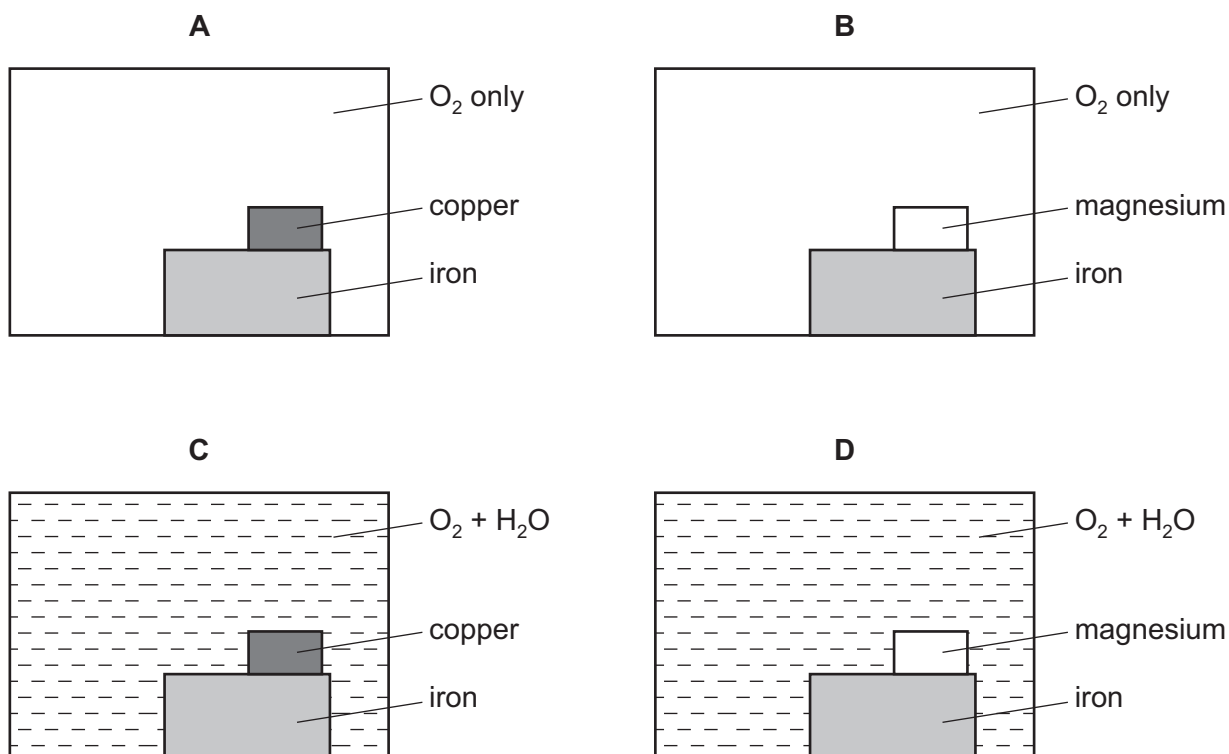
- A** calcium
- B** copper
- C** lead
- D** silver

28 The equations show reactions taking place in the blast furnace.

In which reaction is an acidic impurity, present in iron ore, removed?

- A**  $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$
- B**  $\text{C} + \text{CO}_2 \rightarrow 2\text{CO}$
- C**  $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$
- D**  $\text{CaCO}_3 + \text{SiO}_2 \rightarrow \text{CaSiO}_3 + \text{CO}_2$

- 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 In the electrolysis of molten aluminium oxide, which statement is correct?

- A The molar ratio of aluminium to oxygen gas formed is 1 : 2.
- B The molar ratio of aluminium to oxygen gas formed is 3 : 4.
- C Oxygen gas is formed at the anode.
- D Reduction occurs at the anode.

- 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

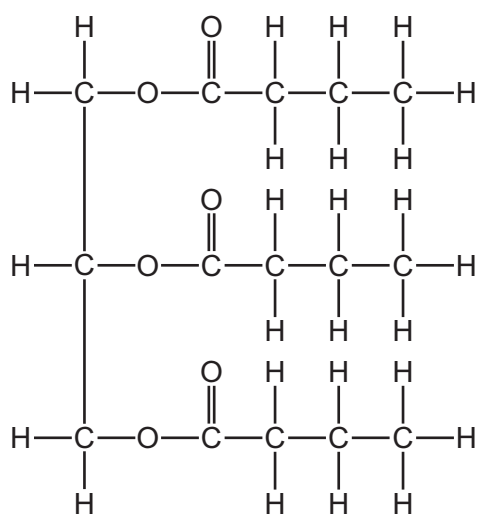
**32** Sea water is not safe to drink. It can be converted into drinkable water by desalination.

What does desalination involve?

- A** adding chlorine to kill bacteria
- B** boiling the water to sterilise it
- C** removing the salt by filtration
- D** separating the water by distillation

**33** Fats are essential components of the human diet.

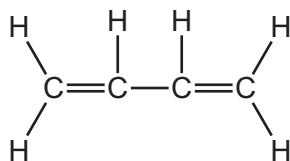
The diagram shows a fat molecule.



Which description of this fat molecule is correct?

- A** saturated carboxylic acid
- B** saturated ester
- C** unsaturated carboxylic acid
- D** unsaturated ester

34 A molecule of the compound  $C_4H_6$  is shown.



This molecule undergoes an addition reaction with excess bromine and an addition reaction with steam.

One molecule of  $C_4H_6$  reacts with .....1..... of bromine.

When  $C_4H_6$  reacts with steam, .....2..... is formed.

Which words complete gaps 1 and 2?

	1	2
<b>A</b>	one molecule	an alcohol
<b>B</b>	one molecule	a carboxylic acid
<b>C</b>	two molecules	an alcohol
<b>D</b>	two molecules	a carboxylic acid

35 The molecules of two hydrocarbon compounds X and Y each contain only four carbon atoms.

X is saturated and Y is unsaturated.

Which statements are correct?

- Under suitable conditions Y polymerises.
- The complete combustion of 1 mole of Y produces more carbon dioxide than the complete combustion of 1 mole of X.
- One molecule of Y contains more hydrogen atoms than one molecule of X.

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

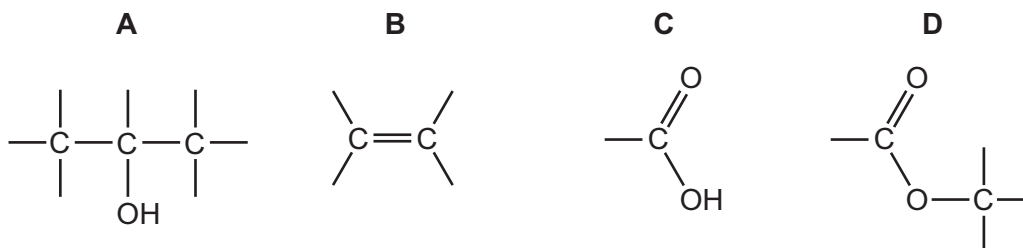
36 Which conversions involve oxidation?

- ethanol  $\rightarrow$  carbon dioxide + water
- ethanol  $\rightarrow$  ethanoic acid
- ethene  $\rightarrow$  poly(ethene)

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

37 Compound T reacts with magnesium, aqueous sodium hydroxide and ethanol.

Which group does T contain?



38 Which type of reaction could be used in the polymerisation of ethene?

- A** addition
- B** condensation
- C** cracking
- D** esterification

39 Insulin is a protein made in the human body.

Which statements about insulin are correct?

- 1 It is a condensation polymer.
- 2 It is a synthetic polymer.
- 3 When hydrolysed it produces only one monomer.
- 4 It contains amide linkages.

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

40 Which statement about polymers is correct?

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

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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	europlum	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	femium	—	101	Md	mendelevium	—	102	No	nobelium	—	103	Lr	lawrencium	—

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