



Cambridge IGCSE™

CHEMISTRY

0620/11

Paper 1 Multiple Choice (Core)

October/November 2023

45 minutes

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.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

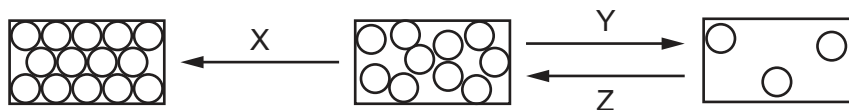
This document has **16** pages. Any blank pages are indicated.



2

- 1 The three rectangles show the arrangements of the particles in each of the three states of matter.

X, Y and Z represent the processes needed to change from one state to another.



What are the processes X, Y and Z?

	X	Y	Z
A	melting	condensing	evaporating
B	evaporating	melting	freezing
C	melting	freezing	condensing
D	freezing	evaporating	condensing

- 2 Which substance is a pure compound?

- A** air
B brass
C ethanol
D petroleum

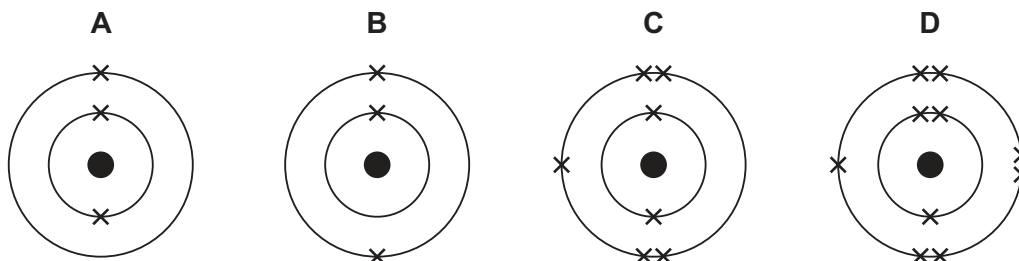
- 3 The Group I element potassium forms an ionic bond with the Group VII element fluorine.

Which two ions are produced?

- A** K^+ and F^+ **B** K^+ and F^- **C** K^- and F^- **D** K^- and F^+

- 4 An isotope of lithium has the symbol ${}^7_3\text{Li}$.

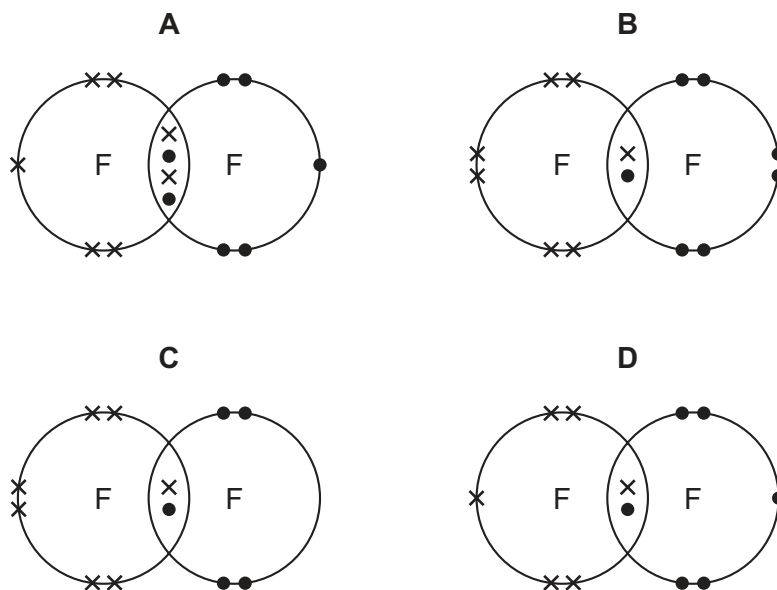
What is the arrangement of electrons in one atom of this isotope of lithium?



3

- 5 Fluorine, F_2 , is in the same group of the Periodic Table as chlorine, Cl_2 .

Which diagram represents the arrangement of the outer-shell electrons in a molecule of fluorine?



- 6 Which use of graphite depends on the layers of carbon atoms being able to slide over each other?

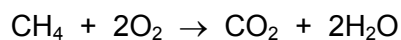
- A** cutting tools
B electrodes
C jewellery
D lubricant

- 7 Which equations are balanced?

- 1 $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$
 2 $ZnCO_3 + 2HCl \rightarrow ZnCl_2 + CO_2 + 2H_2O$
 3 $Mg(NO_3)_2 + NaOH \rightarrow Mg(OH)_2 + 2NaNO_3$
 4 $CaCO_3 + H_2SO_4 \rightarrow CaSO_4 + H_2O + CO_2$

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

- 8 The equation for the combustion of methane is shown.



Which mass of methane produces 36 g of water?

- A** 16 g **B** 18 g **C** 32 g **D** 64 g

4

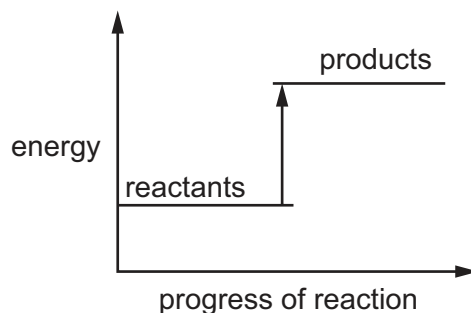
- 9 What is produced at each electrode during the electrolysis of aqueous solutions using inert electrodes?

	positive electrode (anode)	negative electrode (cathode)
A	metals or hydrogen	non-metals only
B	metals or oxygen	non-metals only
C	non-metals only	metals or hydrogen
D	non-metals only	metals or oxygen

- 10 Which statement about a hydrogen-oxygen fuel cell in a car is correct?

- A** The fuel cell produces heat, which powers the car.
- B** The fuel cell is supplied with hydrogen directly from the air.
- C** The only emission from the fuel cell is nitrogen gas, which is non-polluting.
- D** The fuel cell produces electricity, which powers an electric motor.

- 11 The reaction pathway diagram for a reaction is shown.



Which statements are correct?

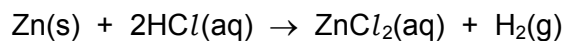
- 1 The reaction is exothermic.
- 2 The reaction is endothermic.
- 3 The temperature of the surroundings increases.
- 4 The temperature of the surroundings decreases.

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

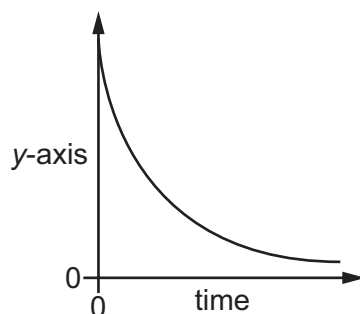
- 12 Which process involves a chemical change?

- A** adding sodium to water
- B** boiling water
- C** dissolving sodium chloride in water
- D** producing water from aqueous sodium chloride

- 13 An experiment is carried out to find the rate of reaction between hydrochloric acid and zinc.



The results of the experiment are shown.



What is the label on the y-axis?

- A amount of ZnCl_2 produced
 - B concentration of HCl
 - C mass of Zn reacted
 - D volume of H_2 produced
- 14 Solid S changes colour from white to blue when water is added.

What is S?

- A anhydrous cobalt(II) chloride
 - B anhydrous copper(II) sulfate
 - C hydrated cobalt(II) chloride
 - D hydrated copper(II) sulfate
- 15 Which equation shows the reduction of copper?
- A $\text{CuO} + \text{C} \rightarrow \text{Cu} + \text{CO}$
 - B $2\text{CuS} + 3\text{O}_2 \rightarrow 2\text{CuO} + 2\text{SO}_2$
 - C $\text{Cu(g)} \rightarrow \text{Cu(l)}$
 - D $\text{Cu(l)} \rightarrow \text{Cu(s)}$

16 Which solids react with dilute sulfuric acid to form aqueous magnesium sulfate?

- 1 magnesium
- 2 magnesium hydroxide
- 3 magnesium nitrate
- 4 magnesium oxide

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

17 Which statements about an aqueous acid are correct?

- 1 Ammonia is formed when solid ammonium nitrate is added to an aqueous acid.
- 2 Effervescence is seen when sodium carbonate is added to an aqueous acid.
- 3 Methyl orange becomes yellow when added to an aqueous acid.
- 4 Red litmus remains red when added to an aqueous acid.

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

18 Copper(II) sulfate is formed by reacting excess solid copper(II) carbonate with dilute sulfuric acid.

Which processes are part of the preparation of solid copper(II) sulfate?

- 1 crystallisation
- 2 distillation
- 3 filtration
- 4 titration

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

19 Element X forms ions with the formula X^{2-} .

Which row describes element X?

	group number	type of element
A	II	metal
B	II	non-metal
C	VI	metal
D	VI	non-metal

20 Which compound is likely to be coloured?

- A** KMnO_4 **B** KNO_3 **C** K_2CO_3 **D** K_2SO_4

21 Chlorine, bromine and iodine are in the same group of the Periodic Table.

Which statements about these three elements are correct?

- 1 Iodine is more reactive than chlorine.
- 2 They are diatomic covalent molecules.
- 3 They are all gases at room temperature.
- 4 Their atoms have seven electrons in their outer shell.

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

22 The electronic configurations of four elements, P, Q, R and S, are shown.

element	electronic configuration
P	2
Q	2,2
R	2,6
S	2,8

Which elements are unreactive monatomic gases?

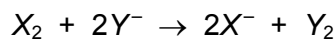
- A** P and Q **B** P and S **C** Q and R **D** S only

23 The table shows some physical properties of four different substances.

Which row describes the properties of a non-metallic element?

	melting point / °C	conductivity when solid	conductivity when melted
A	63	good	good
B	119	poor	poor
C	659	good	good
D	808	poor	good

- 24** The equation shows the reaction between a halogen and the aqueous ions of another halogen.



What is X_2 and the colour of Y^- ?

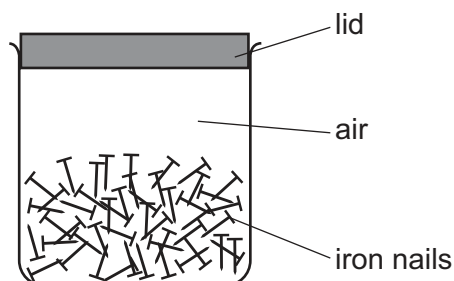
	X_2	Y^-
A	chlorine	brown
B	chlorine	colourless
C	iodine	brown
D	iodine	colourless

- 25** Zinc oxide reacts with carbon to produce zinc.

Which equation represents this reaction?

- A** $2ZnO + C \rightarrow 2Zn + CO$
B $2ZnO + 2C \rightarrow 2Zn + 2CO_2$
C $ZnO + C \rightarrow Zn + CO$
D $ZnO + 2C \rightarrow Zn + 2CO_2$

- 26** Iron nails are stored in an airtight container.



The nails begin to rust after a few days.

How can the rusting of the nails be prevented?

- A** Leave the lid off.
B Replace the air with argon.
C Put the container in a warm place.
D Seal the container in a bag.

27 Four substances present in the blast furnace during iron extraction are listed.

- 1 calcium carbonate
- 2 carbon dioxide
- 3 carbon monoxide
- 4 iron(III) oxide

Which substances are both a reactant and a product during the reactions occurring in the blast furnace?

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

28 Which test is used to show that a sample of water is pure?

- A** Evaporate the water to see if any solids remain.
- B** Heat the water to check its boiling point.
- C** Test with anhydrous cobalt(II) chloride.
- D** Use universal indicator paper to check its pH.

29 Which mixture of salts produces an NPK fertiliser?

- A** ammonium phosphate + potassium sulfate
- B** calcium phosphate + sodium nitrate
- C** potassium nitrate + calcium sulfate
- D** sodium phosphate + ammonium nitrate

30 What are the **main** products obtained by the fractional distillation of liquid air?

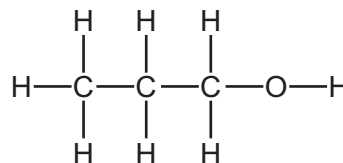
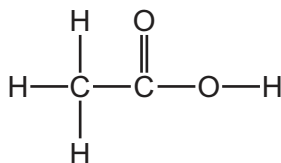
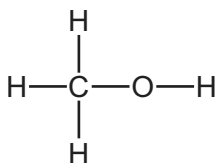
- A** carbon dioxide and oxygen
- B** carbon dioxide and water vapour
- C** nitrogen and oxygen
- D** nitrogen and water vapour

31 In which reaction is the rate of reaction increased by light?

- A** carbon dioxide + water → glucose + oxygen
- B** ethanoic acid + sodium carbonate → sodium ethanoate + water + carbon dioxide
- C** ethene + bromine → dibromoethane
- D** methane + oxygen → carbon dioxide + water

10

32 The structures of three organic molecules are shown.



Which description of the three molecules is correct?

	they all have the same general formula, $\text{C}_n\text{H}_{2n+1}\text{OH}$	they all belong to the same homologous series
A	no	no
B	no	yes
C	yes	no
D	yes	yes

33 Petroleum is separated into fractions by fractional distillation.

Which row describes a use of the named fraction?

	fraction	use
A	bitumen	fuel for ships
B	refinery gas	jet fuel
C	fuel oil	road making
D	gasoline	fuel for cars

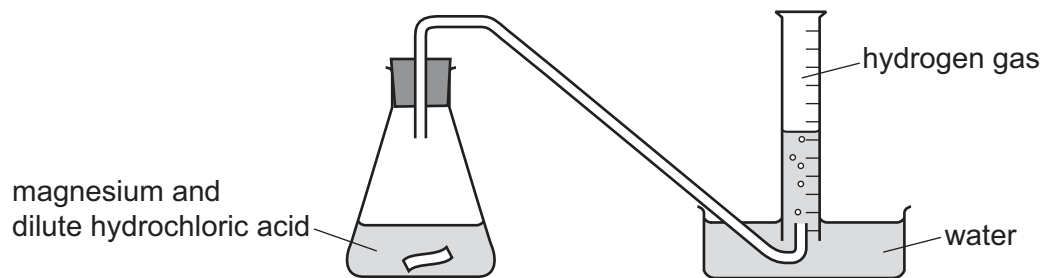
34 Which statement about alkanes is correct?

- A** They are saturated.
- B** They are very reactive.
- C** They contain carbon, hydrogen and oxygen only.
- D** They contain double bonds.

35 What is the approximate volume of nitrogen in 200 cm^3 of air?

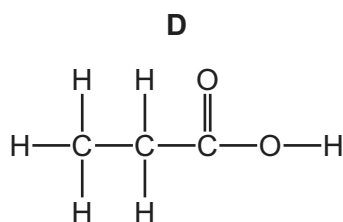
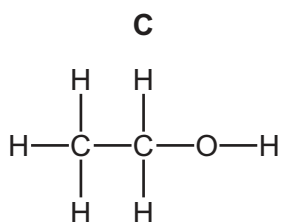
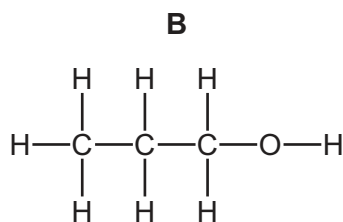
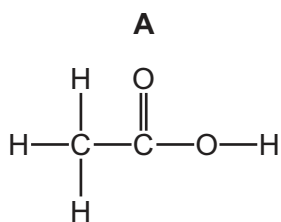
- A** 20 cm^3
- B** 40 cm^3
- C** 80 cm^3
- D** 160 cm^3

- 36 The apparatus used to investigate the rate at which hydrogen gas is given off when a piece of magnesium reacts with dilute hydrochloric acid is shown.



Which additional piece of apparatus is needed to determine the rate of reaction?

- A balance
 - B burette
 - C stop-watch
 - D volumetric pipette
- 37 Which diagram shows the displayed formula of ethanol?

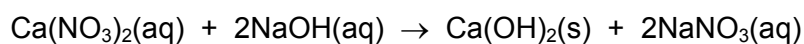


- 38 Ethane is used as a fuel.

Which equation shows the complete combustion of ethane?

- A $2\text{C}_2\text{H}_6 + 7\text{O}_2 \rightarrow 4\text{CO}_2 + 6\text{H}_2\text{O}$
- B $2\text{C}_2\text{H}_6 + 5\text{O}_2 \rightarrow 4\text{CO} + 6\text{H}_2\text{O}$
- C $\text{C}_2\text{H}_4 + 3\text{O}_2 \rightarrow 2\text{CO}_2 + 2\text{H}_2\text{O}$
- D $\text{C}_2\text{H}_4 + 2\text{O}_2 \rightarrow 2\text{CO} + 2\text{H}_2\text{O}$

- 39** The equation for the reaction of aqueous calcium nitrate and aqueous sodium hydroxide is shown.



Which process is used to remove calcium hydroxide from the mixture?

- A** chromatography
 - B** crystallisation
 - C** distillation
 - D** filtration
- 40** The results of two tests on aqueous compound X are given.

test	result
warm with aluminium foil and aqueous sodium hydroxide	ammonia is produced
aqueous sodium hydroxide	brown precipitate

What is X?

- A** iron(III) nitrate
- B** iron(II) nitrate
- C** iron(III) sulfate
- D** iron(II) sulfate

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The Periodic Table of Elements

Group																		
I	II											III	IV	V	VI	VII	VIII	
1Hhydrogen1 Key atomic number atomic symbol name relative atomic mass																		
3Li lithium 7	4Be beryllium 9																	
11Na sodium 23	12Mg magnesium 24																	
19K potassium 39	20Ca calcium 40	21Sc scandium 45	22Ti titanium 48	23V vanadium 51	24Cr chromium 52	25Mn manganese 55	26Fe iron 56	27Co cobalt 59	28Ni nickel 59	29Cu copper 64	30Zn zinc 65	31Ga gallium 70	32Ge germanium 73	33As arsenic 75	34Se selenium 79	35Br bromine 80	36Kr krypton 84	
37Rb rubidium 85	38Sr strontium 88	39Y yttrium 89	40Zr zirconium 91	41Nb niobium 93	42Mo molybdenum 96	43Tc technetium —	44Ru ruthenium 101	45Rh rhodium 103	46Pd palladium 106	47Ag silver 108	48Cd cadmium 112	49In indium 115	50Sn tin 119	51Sb antimony 122	52Te tellurium 128	53I iodine 127	54Xe xenon 131	
55Cs caesium 133	56Ba barium 137	57–71 lanthanoids		72Hf hafnium 178	73Ta tantalum 181	74W tungsten 184	75Re rhenium 186	76Os osmium 190	77Ir iridium 192	78Pt platinum 195	79Au gold 197	80Hg mercury 201	81Tl thallium 204	82Pb lead 207	83Bi bismuth 209	84Po polonium —	85At astatine —	86Rn radon —
87Fr francium —	88Ra radium —	89–103 actinoids		104Rf rutherfordium —	105Db dubnium —	106Sg seaborgium —	107Bh bohrium —	108Hs hassium —	109Mt meitnerium —	110Ds darmstadtium —	111Rg roentgenium —	112Cn copernicium —	113Nh nihonium —	114Fl flerovium —	115Mc moscovium —	116Lv livermorium —	117Ts tennessine —	118Og oganeson —

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
	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 dm³ at room temperature and pressure (r.t.p.).