



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

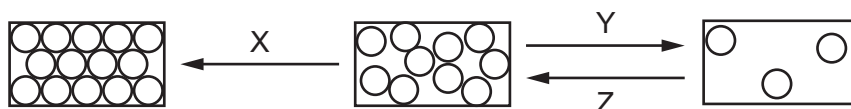
- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

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



- 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

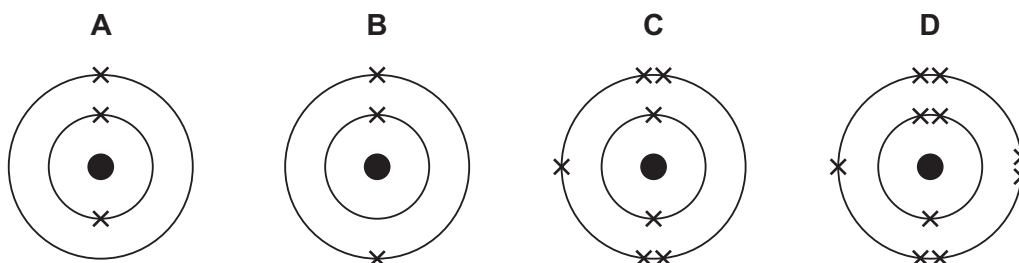
- 3 The Group I element potassium forms an ionic bond with the Group VII element fluorine.

Which two ions are produced?

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

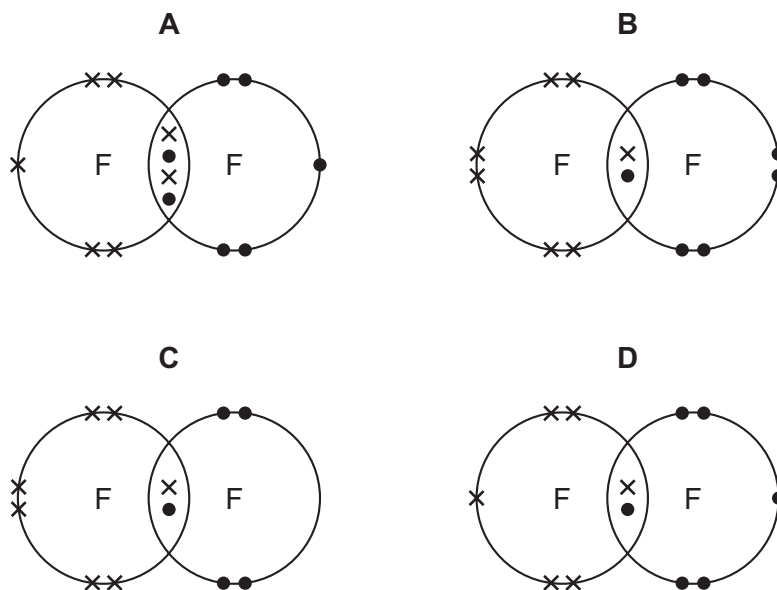
- 4 An isotope of lithium has the symbol ${}^7_3\text{Li}$.

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



- 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?

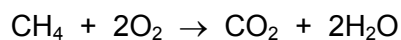
- A cutting tools
- B electrodes
- C jewellery
- D lubricant

- 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

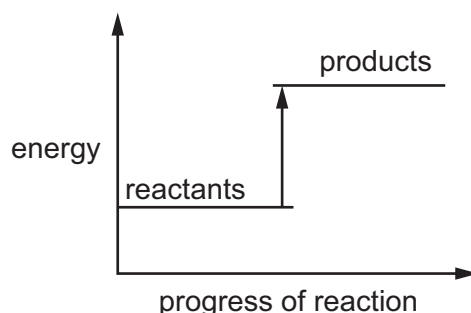
- 9 What is produced at each electrode during the electrolysis of aqueous solutions using inert electrodes?

	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?

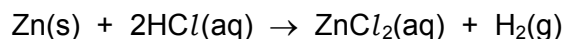
- 1 The reaction is exothermic.
- 2 The reaction is endothermic.
- 3 The temperature of the surroundings increases.
- 4 The temperature of the surroundings decreases.

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

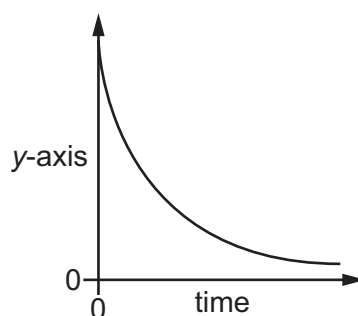
- 12 Which process involves a chemical change?

- 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?

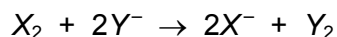
- A** P and Q **B** P and S **C** Q and R **D** S only

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^- ?

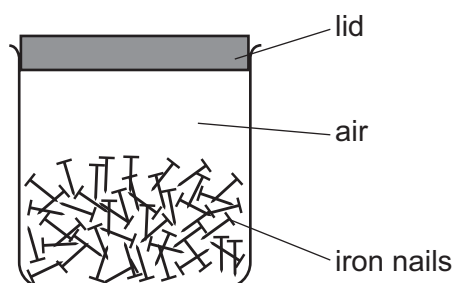
	X_2	Y^-
A	chlorine	brown
B	chlorine	colourless
C	iodine	brown
D	iodine	colourless

- 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

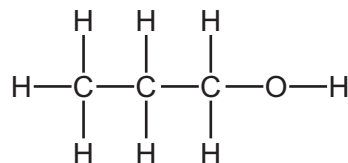
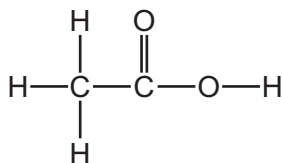
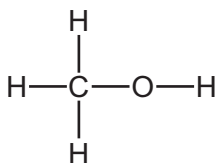
30 What are the **main** products obtained by the fractional distillation of liquid air?

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

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

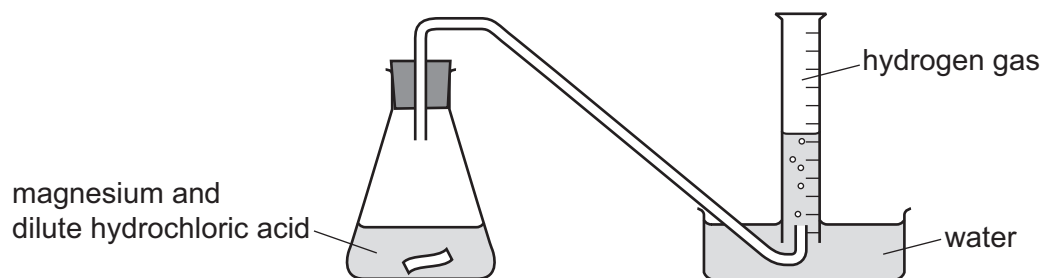
34 Which statement about alkanes is correct?

- 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?

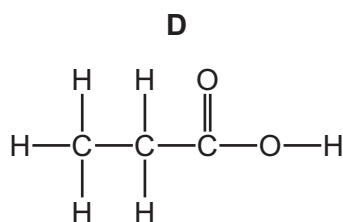
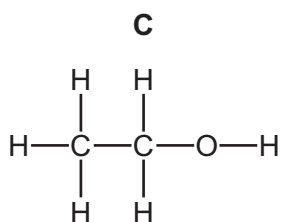
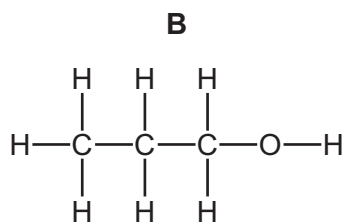
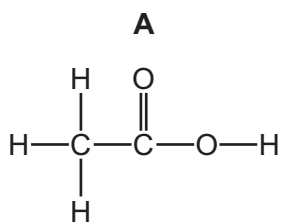
- A** 20 cm^3
- B** 40 cm^3
- C** 80 cm^3
- D** 160 cm^3

- 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?

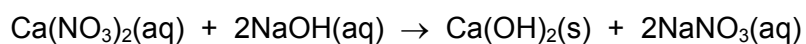


- 38 Ethane is used as a fuel.

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

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