



Cambridge IGCSE™

CHEMISTRY

0620/12

Paper 1 Multiple Choice (Core)

February/March 2025

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 Substance L takes the shape of the container that holds it.

What could be the state of matter of substance L?

- A liquid or gas
- B gas or solid
- C solid or liquid
- D solid only

- 2 The melting points and boiling points of pure substances M, N and O are shown.

	M	N	O
melting point / °C	-114	115	-101
boiling point / °C	78	445	-34

The substances are chlorine, ethanol and sulfur.

Which row identifies M, N and O?

	M	N	O
A	chlorine	ethanol	sulfur
B	ethanol	sulfur	chlorine
C	sulfur	chlorine	ethanol
D	sulfur	ethanol	chlorine

- 3 Which statement explains why the noble gases are unreactive?

- A They are in the same group of the Periodic Table.
- B They are gases at room temperature.
- C They each have a full outer electron shell.
- D They are found in air.

- 4 What is the electronic configuration of a P^{3-} ion?

- A 2,8,2
- B 2,8,5
- C 2,8,6
- D 2,8,8

- 5 Some information about four metal atoms or ions is shown.

atom or ion	charge	proton number	number of electrons	nucleon number
Q	+3		10	27
R	+2	12		24
S	+2		10	26
T		16	16	

Which two atoms or ions are from isotopes of the same element?

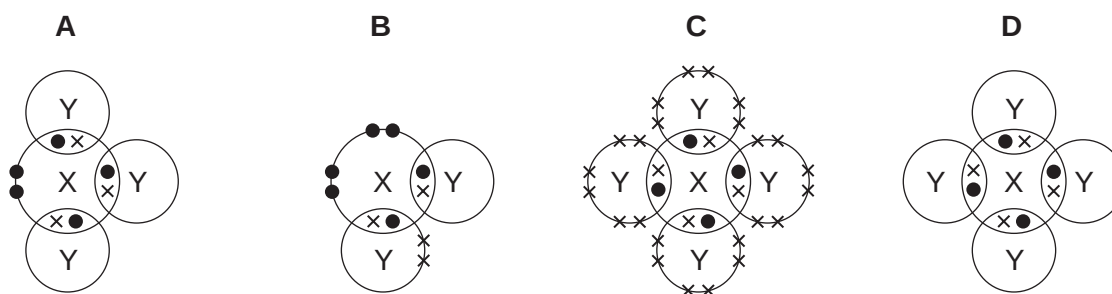
- A** Q and R **B** Q and T **C** R and S **D** S and T

- 6 Which row describes the changes to the atoms when a metal and a non-metal react together?

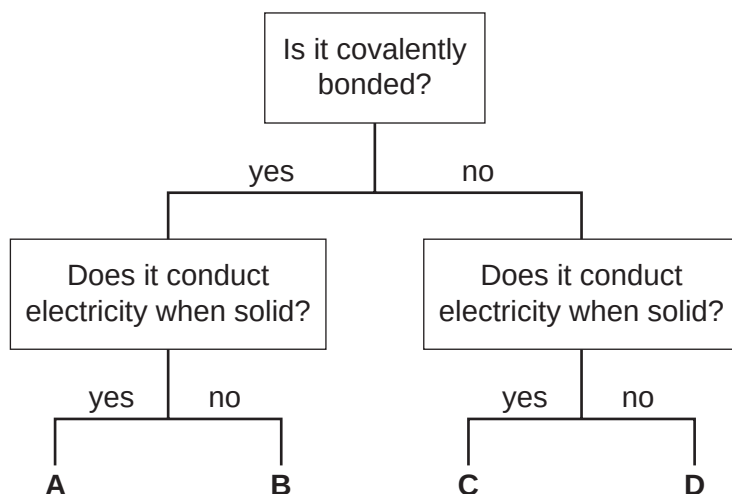
	metal atoms	non-metal atoms
A	gain electrons to form anions	lose electrons to form cations
B	gain electrons to form cations	lose electrons to form anions
C	lose electrons to form anions	gain electrons to form cations
D	lose electrons to form cations	gain electrons to form anions

- 7 In the following diagrams, X and Y are atoms of different elements.

Which diagram correctly shows the arrangement of outer shell electrons in a molecule of methane?



8 Which pathway describes the properties of graphite?

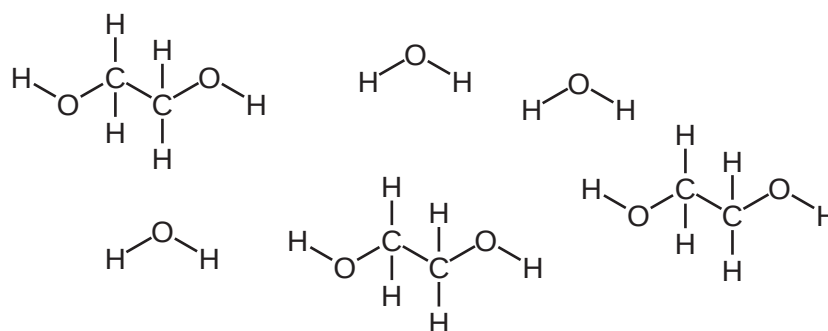


9 Which row identifies the formula of the named substance?

	substance	formula
A	cobalt(II) chloride	CuCl_2
B	ethane	C_2H_6
C	helium	He_2
D	iron(III) oxide	Fe_3O_2

10 Antifreeze contains a mixture of water and ethylene glycol.

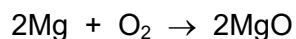
The diagram shows their displayed formulae.



What is the molecular formula of ethylene glycol?

- A** CHO **B** $\text{C}_2\text{H}_6\text{O}_2$ **C** $\text{C}_2\text{H}_8\text{O}_3$ **D** $\text{C}_6\text{H}_{18}\text{O}_6$

- 11 The equation for the reaction of magnesium with oxygen is shown.



In an experiment, 6.0 g of magnesium is reacted with excess oxygen.

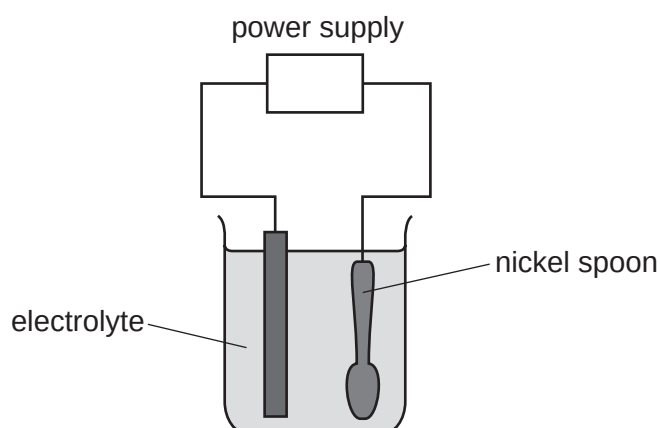
Which mass of magnesium oxide, MgO, is produced?

- A** 10 g **B** 20 g **C** 40 g **D** 80 g

- 12 Which products are formed when dilute sulfuric acid undergoes electrolysis?

	product formed at the anode	product formed at the cathode
A	oxygen	hydrogen
B	hydrogen	oxygen
C	sulfur dioxide	hydrogen
D	oxygen	sulfur dioxide

- 13 The diagram shows an experiment to electroplate a nickel spoon with silver.



Which row correctly describes the positive electrode, the negative electrode and the electrolyte?

	positive electrode	negative electrode	electrolyte
A	nickel spoon	pure nickel	silver nitrate solution
B	nickel spoon	pure silver	nickel nitrate solution
C	pure nickel	nickel spoon	silver nitrate solution
D	pure silver	nickel spoon	silver nitrate solution

- 14 When dilute sulfuric acid reacts with aqueous sodium hydroxide, the temperature of the solution increases.

Which words describe this reaction?

- A endothermic and neutralisation
 - B endothermic and redox
 - C exothermic and neutralisation
 - D exothermic and redox
- 15 Which statement is correct for **both** physical and chemical changes?
- A Covalent bonds are broken and formed during the changes.
 - B The total mass of substance is the same before and after the changes.
 - C The changes are usually reversible.
 - D The temperature always rises or falls during the changes.
- 16 A sample of calcium carbonate reacts with dilute hydrochloric acid to produce a final volume of 60 cm^3 of gas.

The reaction finishes after 120 seconds.

The experiment is repeated at a lower temperature. All other conditions stay the same.

Which row shows the results of the second experiment?

	final volume of gas produced / cm^3	time for reaction to finish / s
A	40	120
B	40	160
C	60	120
D	60	160

- 17 In which equation is the iron oxidised?

- A $\text{C} + \text{FeO} \rightarrow \text{CO} + \text{Fe}$
- B $3\text{CO} + \text{Fe}_2\text{O}_3 \rightarrow 3\text{CO}_2 + 2\text{Fe}$
- C $\text{Fe}_2\text{O}_3 + \text{H}_2 \rightarrow 2\text{FeO} + \text{H}_2\text{O}$
- D $\text{PbO} + \text{Fe} \rightarrow \text{Pb} + \text{FeO}$

18 HOCl is an acid.

NH_4OH is an alkali.

Which row shows the ions present in aqueous solutions that identify the acid and the alkali?

	HOCl(aq)	$\text{NH}_4\text{OH(aq)}$
A	H^+	H^+
B	H^+	OH^-
C	OH^-	H^+
D	OH^-	OH^-

19 Which elements form an oxide that reacts with water to produce a blue solution with thymolphthalein?

- 1 calcium
- 2 carbon
- 3 sulfur

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

20 A sample of fertiliser is tested by warming it with aqueous sodium hydroxide.

A colourless gas is produced which turns damp red litmus paper blue.

Which element, essential for plant growth, must be present?

- A** nitrogen
- B** phosphorus
- C** potassium
- D** sulfur

- 21** Insoluble solid magnesium carbonate reacts with dilute sulfuric acid.

The equation is shown.



The steps used to make crystals of magnesium sulfate are listed.

- step 1 Add excess magnesium carbonate to dilute sulfuric acid and stir the mixture.
- step 2 Filter the mixture.
- step 3 Heat the filtrate to the point of crystallisation.
- step 4 Leave the filtrate to cool.

What is the residue removed from the mixture in step 2?

- A** magnesium carbonate
 - B** sulfuric acid
 - C** magnesium sulfate
 - D** water
- 22** Which trend occurs across the period from sodium to argon?
- A** a change from metal to non-metal
 - B** an increase in melting point
 - C** a more violent reaction with water
 - D** an increase in electrical conductivity
- 23** Which statement about the element bromine is correct?
- A** It displaces chlorine from aqueous potassium chloride.
 - B** It has a higher density than chlorine.
 - C** It is a diatomic metal.
 - D** It is a green gas at room temperature.
- 24** Metallic element X has a high density.

Which part of the Periodic Table is X in?

- A** Group I
- B** halogens
- C** transition elements
- D** Group VIII

25 Which statement about the uses of metals is correct?

- A Aluminium has a low density and good electrical conductivity which make it suitable for overhead electrical cables.
- B Aluminium food containers can only be used for a short time because chemicals in the food react with the aluminium.
- C Electrical wiring made from copper is covered with plastic because copper corrodes easily.
- D Copper is used in the manufacture of aircraft because it has a low density and is **not** malleable.

26 Steel bridges are painted to help stop rust from forming on their surfaces.

What causes steel to rust?

- A water, oxygen and sunlight
- B water and oxygen only
- C water and sunlight only
- D oxygen and sunlight only

27 Which two metals are mixed together to make brass?

- 1 tin
- 2 zinc
- 3 nickel
- 4 copper

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

28 Metal M is between zinc and iron in the reactivity series.

Which statements about metal M are correct?

- 1 It reacts with cold water to produce hydrogen gas.
- 2 It does **not** react with cold water but will react with dilute hydrochloric acid.
- 3 The metal can be obtained from its oxide by heating it strongly with carbon.
- 4 The metal oxide **cannot** be reduced using carbon.

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

29 What is the colour change when water is added to anhydrous copper(II) sulfate?

- A** blue to white
- B** blue to pink
- C** pink to blue
- D** white to blue

30 Which statement about the composition of clean, dry air is correct?

- A** It contains 78% oxygen.
- B** It contains 21% nitrogen.
- C** It contains less than 1% argon.
- D** It contains 4% carbon dioxide.

31 Which row identifies a source and an adverse effect of methane?

	source	adverse effect
A	car engines	acid rain
B	car engines	climate change
C	decomposition of vegetation	acid rain
D	decomposition of vegetation	climate change

32 Which statements about alkenes are correct?

- 1 Propene is a saturated hydrocarbon.
- 2 Ethene is made by heating long-chain alkanes to a high temperature in the presence of a catalyst.
- 3 Hexene reacts with aqueous bromine, changing its colour from colourless to orange.
- 4 Ethene, propene and butene have the same general formula.

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

33 The table shows the formulae and names of some organic compounds.

	formula	name
1	CH_3Cl	chloroethane
2	CH_3COOH	ethanoic acid
3	$\text{BrCH}_2\text{CH}_2\text{Br}$	1,2-dibromoethane
4	$(\text{CH}_3\text{COO})_2\text{Ca}$	calcium methanoate

Which rows give the correct name for the formula shown?

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

34 Which gas is the main constituent of natural gas?

- A** hydrogen
B nitrogen
C methane
D oxygen

35 A sample of petroleum is separated into three fractions, X, Y and Z, using fractional distillation.

Some properties of X, Y and Z are listed.

- X is more viscous than Z.
- Y has a higher boiling point than X.

Which fraction has the longest carbon chain and which fraction is the most volatile?

	longest carbon chain	most volatile
A	Y	X
B	Y	Z
C	Z	X
D	Z	Y

36 Two salt solutions, P and Q, are tested.

The table shows the results.

test	P	Q
a few drops of aqueous sodium hydroxide are added	green precipitate forms	red-brown precipitate forms
a few drops of dilute nitric acid and a few drops of barium nitrate are added	no change seen	white precipitate forms
a few drops of dilute nitric acid and a few drops of silver nitrate are added	white precipitate forms	no change seen

What are P and Q?

	P	Q
A	iron(II) chloride	iron(III) sulfate
B	iron(III) chloride	iron(III) sulfate
C	iron(II) sulfate	iron(III) chloride
D	iron(III) sulfate	iron(III) chloride

37 A small quantity of a solid, E, is added to a large excess of aqueous ethanoic acid.

No bubbles of gas are seen and the solid dissolves to give a colourless solution.

What is solid E?

- A** calcium hydroxide
- B** copper(II) oxide
- C** magnesium
- D** sodium carbonate

38 Ethanol is manufactured by two different processes.

Which raw materials are used by the two processes to make ethanol?

- 1 glucose
- 2 ethane
- 3 ethene
- 4 steam

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

39 What is used to test for chlorine?

- A** a glowing splint
- B** damp litmus paper
- C** limewater
- D** aqueous potassium manganate(VII)

40 Which statement about paper chromatography is correct?

- A** It can show if a substance is pure.
- B** It can separate a mixture of insoluble substances.
- C** It can separate a compound into its elements.
- D** It provides a way of combining substances to make new coloured compounds.

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