



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.



- 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?

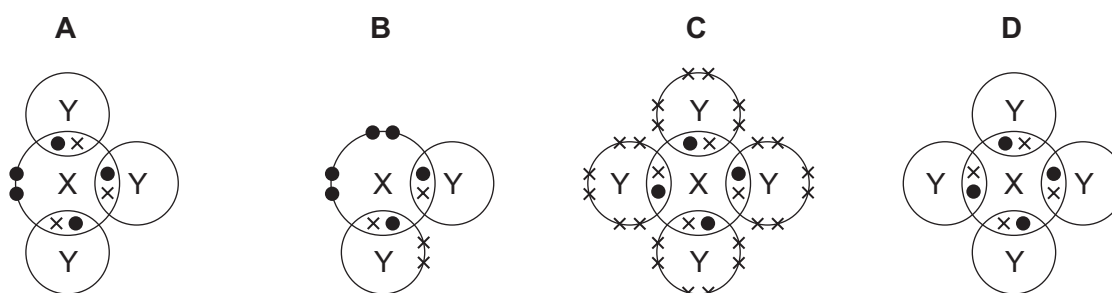
- A** Q and R **B** Q and T **C** R and S **D** S and T

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

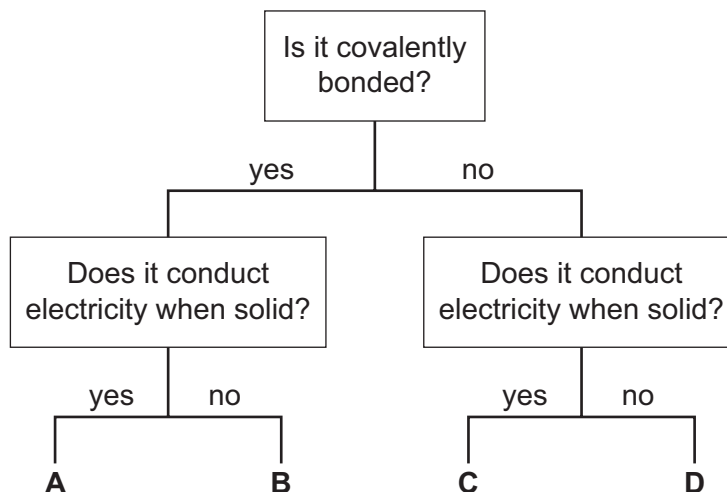
	metal atoms	non-metal atoms
A	gain electrons to form anions	lose electrons to form cations
B	gain electrons to form cations	lose electrons to form anions
C	lose electrons to form anions	gain electrons to form cations
D	lose electrons to form cations	gain electrons to form anions

- 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?

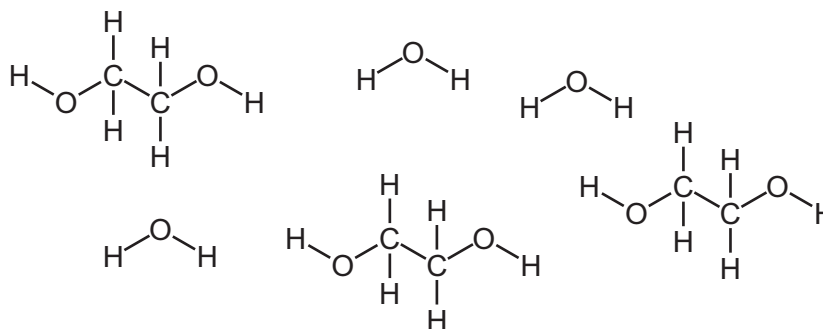


9 Which row identifies the formula of the named substance?

	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.

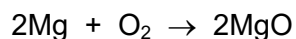
The diagram shows their displayed formulae.



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.

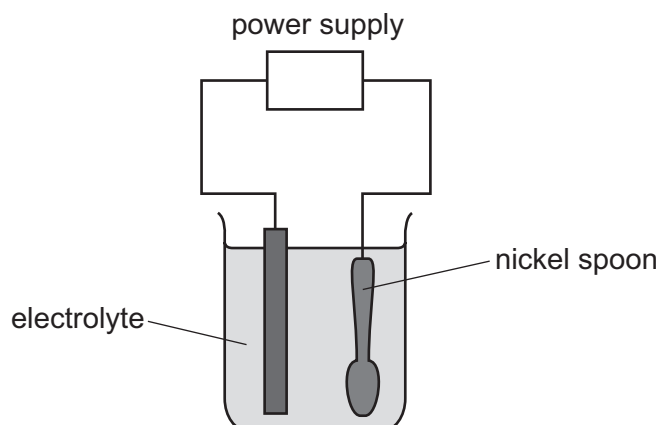
Which mass of magnesium oxide, MgO, is produced?

- 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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The Periodic Table of Elements

Group

I	II	Group										III	IV	V	VI	VII	VIII
		Key atomic number atomic symbol name relative atomic mass										1Hhydrogen1					
3Li lithium 7	4Be beryllium 9											5B boron 11	6C carbon 12	7N nitrogen 14	8O oxygen 16	9F fluorine 19	2He helium 4
11Na sodium 23	12Mg magnesium 24											13Al aluminium 27	14Si silicon 28	15P phosphorus 31	16S sulfur 32	17Cl chlorine 35.5	18Ar argon 40
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	57–71lanthanoids	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 —	89–103actinoids	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 oganesson —
lanthanoids																	
57La lanthanum 139	58Ce cerium 140	59Pr praseodymium 141	60Nd neodymium 144	61Pm promethium —	62Sm samarium 150	63Eu europium 152	64Gd gadolinium 157	65Tb terbium 159	66Dy dysprosium 163	67Ho holmium 165	68Er erbium 167	69Tm thulium 169	70Yb ytterbium 173	71Lu lutetium 175			
actinoids																	
89Ac actinium —	90Th thorium 232	91Pa protactinium 231	92U uranium 238	93Np neptunium —	94Pu plutonium —	95Am americium —	96Cm curium —	97Bk berkelium —	98Cf californium —	99Es einsteinium —	100Fm fermium —	101Md mendelevium —	102No nobelium —	103Lr lawrencium —			

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