Cambridge Assessment International Education

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)

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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.
- 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.

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[Turn over

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

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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

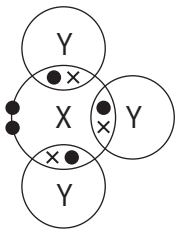
6 Which row describes the changes to the atoms when a metal and a non-metal react together?

	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

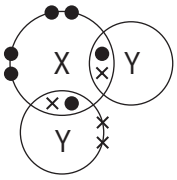
7 In the following diagrams, X and Y are atoms of different elements.

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

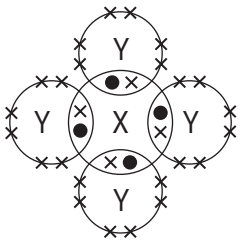
A



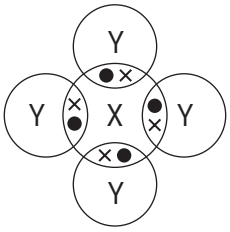
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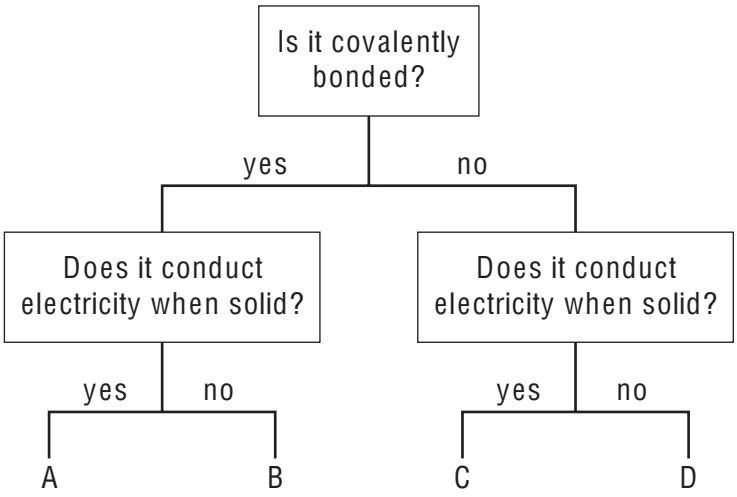
C



D



8 Which pathway describes the properties of graphite?

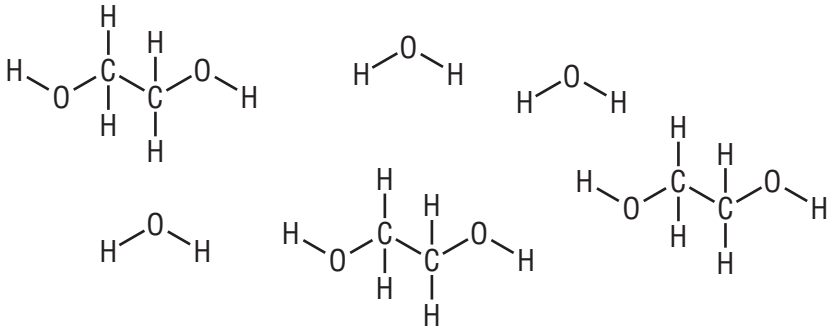


9 Which row identifies the formula of the named substance?

	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** $C_2H_6O_2$ **C** $C_2H_8O_3$ **D** $C_6H_{18}O_6$

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

$$2Mg + O_2 \rightarrow 2MgO$$

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

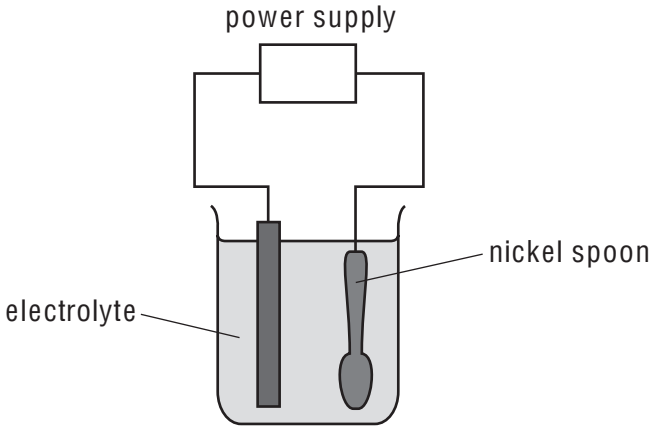
Which mass of magnesium oxide, MgO, is produced?

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 $C + FeO \rightarrow CO + Fe$

B $3CO + Fe_2O_3 \rightarrow 3CO_2 + 2Fe$

C $Fe_2O_3 + H_2 \rightarrow 2FeO + H_2O$

D $PbO + Fe \rightarrow Pb + FeO$

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)	NH_4OH(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.

magnesium carbonate + sulfuric acid → magnesium sulfate + water + carbon dioxide

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

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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

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

	formula	name
1	CH_3Cl	chloroethane
2	CH_3COOH	ethanoic acid
3	$BrCH_2CH_2Br$	1,2-dibromoethane
4	$(CH_3COO)_2Ca$	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	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group VIII
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
11 Na sodium 23	12 Mg magnesium 24											13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium –	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –
87 Fr francium –	88 Ra radium –	89–103 actinoids	104 Rf rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –	113 Nh nihonium –	114 Fl flerovium –	115 Mc moscovium –	116 Lv livermorium –	117 Ts tennessine –	118 Og oganesson –

Key: atomic number / atomic symbol / name / relative atomic mass

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
actinoids	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 dm^3 at room temperature and pressure (r.t.p.).

PMT