Cambridge Assessment International Education

Cambridge IGCSE™

CHEMISTRY **0620/13**

Paper 1 Multiple Choice (Core) **May/June 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 Liquid iron is cooled to form solid iron.

Which statement about the particles in iron is correct?

A The particles move further apart.

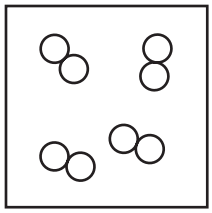
B The particles move faster.

C The position of the particles becomes fixed.

D The attractions between the particles become weaker.

2 Which diagram shows a mixture of an element and a compound?

A



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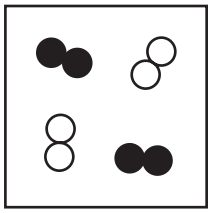

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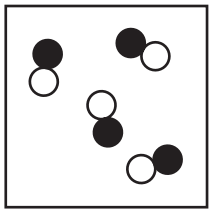

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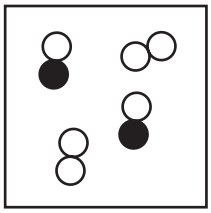


3 Which statement about elements and their atoms is correct?

A Aluminium is in the second period of the Periodic Table and has two occupied electron shells.

B Helium is in Group VIII of the Periodic Table and has eight outer shell electrons.

C Lithium is in Group I of the Periodic Table and has one occupied electron shell.

D Sulfur is in the third period of the Periodic Table and has six outer shell electrons.

4 An atom of the element erbium is represented by $^{167}_{68}\mathrm{Er}$.

Which row shows the number of protons, neutrons and electrons in this atom?

	protons	neutrons	electrons
A	68	99	68
B	68	99	99
C	99	68	68
D	99	68	99

5 Rubidium is in Group I of the Periodic Table and bromine is in Group VII of the Periodic Table.

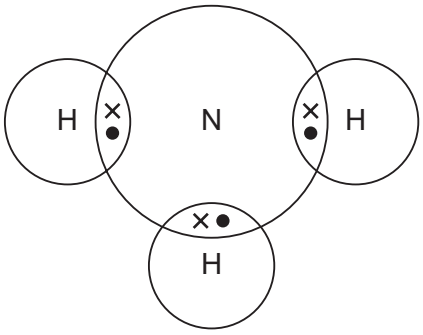
Rubidium reacts with bromine to form an ionic compound.

Which row shows the electron change taking place for rubidium and the correct formula of the rubidium ion formed?

	electron change	formula of ion formed
A	electron gained	Rb^+
B	electron gained	Rb^-
C	electron lost	Rb^+
D	electron lost	Rb^-

6 Which dot-and-cross diagram represents the electronic configuration for the outer shell electrons in ammonia, NH_3?

A



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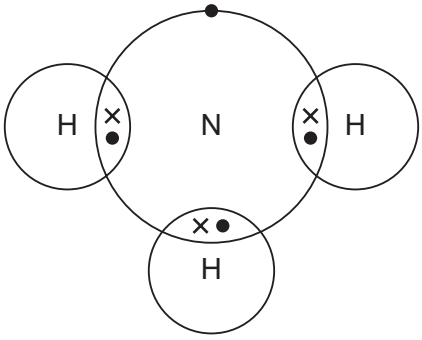

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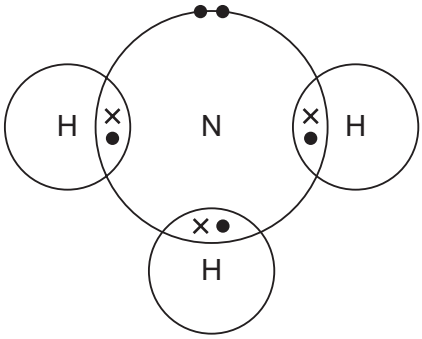

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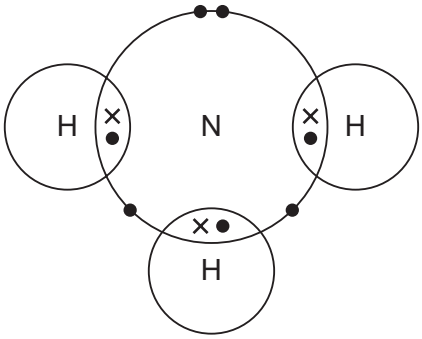


7 Which statements about graphite are correct?

1 Each carbon atom is covalently bonded to four other carbon atoms.

2 Graphite is an electrical conductor because it contains ions that are free to move.

3 Graphite is used as a lubricant because it has layers that slide over each other.

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

8 Which equation represents the reaction of magnesium with dilute hydrochloric acid?

A $Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$

B $Mg(s) + 2HCl(l) \rightarrow MgCl_2(s) + H_2(g)$

C $2Mg(s) + 2HCl(aq) \rightarrow 2MgCl(aq) + H_2(g)$

D $2Mg(s) + 2HCl(l) \rightarrow 2MgCl(s) + H_2(g)$

9 The relative formula mass, M_r, of calcium carbonate, $CaCO_3$, is 100.

What is the mass of carbon present in 100 g of calcium carbonate?

A 12 g **B** 36 g **C** 40 g **D** 60 g

10 What is the definition of relative atomic mass?

A It is the average mass of the isotopes of an element compared to $\frac{1}{12}$th of the mass of an atom of ^{12}C.

B It is the total mass of the isotopes of an element compared to $\frac{1}{12}$th of the mass of an atom of ^{12}C.

C It is the average mass of an element compared to $\frac{1}{12}$th of the mass of an atom of ^{12}C.

D It is the total mass of an element compared to $\frac{1}{12}$th of the mass of an atom of ^{12}C.

11 Which row describes the electrolysis of molten potassium bromide?

	product at anode	product at cathode
A	bromine	hydrogen
B	bromine	potassium
C	hydrogen	bromine
D	potassium	bromine

12 What is produced in a hydrogen–oxygen fuel cell?

A hydrogen and oxygen

B hydrogen only

C carbon dioxide

D water

13 When ammonium nitrate is added to water, the temperature of the mixture decreases.

The ammonium nitrate can be recovered by evaporating the water.

Which statement explains these observations?

A The ammonium nitrate dissolves in the water, and the process is endothermic.

B The ammonium nitrate reacts with the water, and the process is endothermic.

C The ammonium nitrate dissolves in the water, and the process is exothermic.

D The ammonium nitrate reacts with the water, and the process is exothermic.

14 Magnesium is reacted with dilute hydrochloric acid. The table shows the total volume of hydrogen produced every 15 seconds.

time / s	0	15	30	45	60	75	90	105	120
total volume of hydrogen / cm^3	0	18	32	48	59	64	68	72	74

During which time period is the rate of reaction the fastest?

A 0–30 seconds

B 30–60 seconds

C 60–90 seconds

D 90–120 seconds

15 Which substance forms a blue solution when it is added to water?

A cobalt(II) chloride

B copper(II) sulfate

C thymolphthalein

D universal indicator

16 Steam reacts with carbon to produce carbon monoxide and hydrogen.

$$C(s) + H_2O(g) \rightarrow CO(g) + H_2(g)$$

Which substance is reduced in the reaction?

A C **B** CO **C** H_2 **D** H_2O

17 Three compounds are listed.

1 aluminium nitrate

2 ammonium chloride

3 ammonium nitrate

All three compounds are heated with aqueous sodium hydroxide.

Which compounds produce ammonia?

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

18 A solution containing hydroxide ions, $OH^-(aq)$, is added to a solution containing hydrogen ions, $H^+(aq)$. An equation representing the reaction is shown.

$$H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$$

Which statement about the reaction is correct?

A The hydrogen ions represent an alkali.

B The reaction is a neutralisation reaction.

C The reaction is a reduction.

D As the OH^- ions are added, the pH of the reaction mixture falls.

19 Which compound is an acidic oxide?

A barium oxide

B carbon dioxide

C copper(II) oxide

D magnesium oxide

20 Which statement describes a hydrated salt?

A It is an aqueous solution of a salt.

B It is a solid salt that is chemically combined with water.

C It is a solid salt that contains no water.

D It is a salt that has been broken down by water.

21 In the Periodic Table, how does the metallic character of the elements vary from left to right across a period?

A It decreases.

B It increases.

C It increases then decreases.

D It stays the same.

22 Lithium, sodium and potassium are elements in Group I of the Periodic Table.

Which statements about these elements are correct?

1 They react with water to produce hydrogen.

2 The melting point increases down the group.

3 The density decreases down the group.

4 The reactivity increases down the group.

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

23 X, Y and Z are each one of the elements chlorine, bromine and iodine.

When aqueous X is mixed with aqueous ions of Y, there is no reaction.

When aqueous Y is mixed with aqueous ions of Z, there is no reaction.

Which statement is correct?

A X is more reactive than Y.

B X is a pale yellow-green gas at room temperature and pressure.

C Y is a red-brown liquid at room temperature and pressure.

D Z is less reactive than Y.

24 Which row describes the properties of a transition element?

	melting point / °C	density at r.t.p.	colour and state of its oxide at r.t.p.
A	–210	low	brown gas
B	113	high	white solid
C	650	low	white solid
D	1085	high	red solid

25 Which statements about the elements in Group VIII are correct?

1 They all have eight electrons in their outer electron shell.

2 They all react with sodium to form ionic compounds.

3 They are all monatomic gases.

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

26 Sulfur and potassium are two elements in the Periodic Table.

Which row identifies the element with the higher thermal conductivity and the element with the lower malleability?

	higher thermal conductivity	lower malleability
A	sulfur	potassium
B	sulfur	sulfur
C	potassium	sulfur
D	potassium	potassium

27 Three statements about aluminium and copper are listed.

1 The density of aluminium is less than that of copper.

2 The electrical conductivity of copper is higher than that of aluminium.

3 Aluminium is more reactive than copper.

Which statements explain why aluminium is used instead of copper to make overhead power cables?

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

28 The table gives some information about the reactions of four metals, J, K, L and M.

metal	reactions
J	reacts with steam and hydrochloric acid but **not** with cold water
K	reacts with hydrochloric acid but **not** with steam or cold water
L	reacts with hydrochloric acid and with cold water
M	does **not** react with hydrochloric acid

What is the order of reactivity of metals J, K, L and M?

	most reactive → least reactive			
A	L	J	K	M
B	L	K	J	M
C	M	J	K	L
D	M	K	J	L

29 What is the chemical name for rust?

A anhydrous iron(II) oxide

B anhydrous iron(III) oxide

C hydrated iron(II) oxide

D hydrated iron(III) oxide

30 Water from natural sources can contain many dissolved substances.

Which substances are often harmful to aquatic life?

1 dissolved oxygen

2 nitrates

3 phosphates

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

31 Which gas is over 30% of clean, dry air?

A argon

B carbon dioxide

C nitrogen

D oxygen

32 Farmers use fertilisers to replace elements in the soil that have been removed by the crops they grow.

Which elements in the soil are replaced by adding fertilisers?

A Ca, P, O **B** K, O, S **C** N, O, S **D** N, K, P

33 The equation for the reaction between carbon dioxide and water in the presence of chlorophyll and sunlight is shown.

$$\text{carbon dioxide + water} \xrightarrow[\text{sunlight}]{\text{chlorophyll}} \text{glucose + oxygen}$$

Which process does this equation represent?

A combustion

B decomposition

C displacement

D photosynthesis

34 Which statement about members of a homologous series is correct?

A They are elements with the same chemical properties.

B They are compounds with the same functional group.

C They are atoms with the same number of outer shell electrons.

D They are molecules with the same boiling point.

35 The molecular formulae of four organic compounds, W, X, Y and Z, are shown.

W	X	Y	Z
C_3H_8O	C_3H_6	$C_4H_8O_2$	C_6H_{14}

Which statement about compounds W, X, Y and Z is correct?

A W and Z could both be alcohols.

B Y is the only compound that could be a carboxylic acid.

C W is a hydrocarbon.

D X is ethene.

36 Fractional distillation is used to separate petroleum into useful fractions.

Which statement about the properties of the fractions of petroleum is correct?

A The refinery gas fraction has a lower volatility than the gasoline fraction.

B The molecules in the gasoline fraction have a longer chain length than the molecules in the naphtha fraction.

C The naphtha fraction has a higher boiling point than the kerosene fraction.

D The fuel oil fraction has a higher viscosity than the diesel oil fraction.

37 Which statements about the alkanes are correct?

1 They are generally unreactive except in terms of combustion and substitution by chlorine.

2 They have the general formula C_nH_{2n+2}.

3 They contain double carbon–carbon covalent bonds.

4 They decolourise aqueous bromine.

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

38 Which products can be formed by the cracking of one molecule of hexane, C_6H_{14}?

A C_4H_{10} and C_2H_4 only

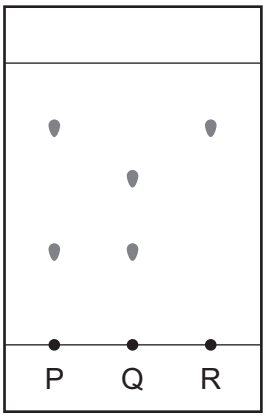
B $C_{12}H_{26}$ and H_2 only

C C_3H_7 only

D C_2H_6 and C_4H_{10} only

39 Three coloured inks, P, Q and R, are tested using paper chromatography.

The chromatogram is shown.



Which statement is correct?

A P is a pure substance.

B P and Q have a colour that could be the same in both inks.

C The top line of the chromatogram is called the baseline.

D All the colours in R are also in Q.

40 The table shows the results of two separate tests on a sample of aqueous T.

test	observation
flame test	yellow flame
add dilute nitric acid	effervescence

What is the identity of T?

A sodium chloride

B calcium chloride

C sodium carbonate

D calcium carbonate

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The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	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.).