Cambridge Assessment International Education

Cambridge IGCSE™

CHEMISTRY **0620/23**

Paper 2 Multiple Choice (Extended) **October/November 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.

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1 What happens to the volume of a fixed mass of gas when pressure and temperature are separately increased?

	volume of gas	
	pressure increased	temperature increased
A	increases	increases
B	no change	decreases
C	decreases	increases
D	no change	increases

2 Which gas diffuses most quickly at room temperature and pressure?

A CH_4 **B** C_2H_6 **C** CO **D** SO_2

3 Which statement defines nucleon number?

A It is the total number of protons in the nucleus of an atom.

B It is the total number of electrons surrounding the nucleus of an atom.

C It is the total number of neutrons in the nucleus of an atom.

D It is the total number of protons and neutrons in the nucleus of an atom.

4 The symbols of four atoms are listed.

1 $^{12}_{6}C$

2 $^{14}_{6}C$

3 $^{14}_{7}N$

4 $^{29}_{14}Si$

Which atoms have more neutrons than protons?

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

5 Which statement describes all positive ions?

A Positive ions have more electrons than neutrons.

B Positive ions have more protons than neutrons.

C Positive ions have more electrons than protons.

D Positive ions have more protons than electrons.

6 A sample of copper has a relative atomic mass of 63.5.

What are the relative abundances of the isotopes in this sample of copper?

A 25% ^{63}Cu and 75% ^{65}Cu

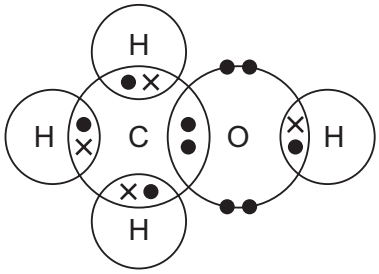
B 50% ^{63}Cu and 50% ^{65}Cu

C 75% ^{63}Cu and 25% ^{65}Cu

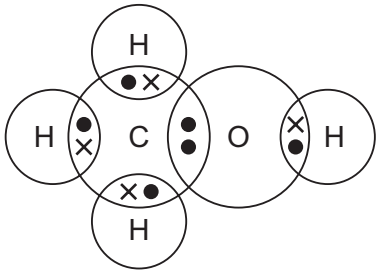
D 90% ^{63}Cu and 10% ^{65}Cu

7 Which diagram shows the outer shell electron arrangement for a molecule of methanol, CH_3OH?

A



B



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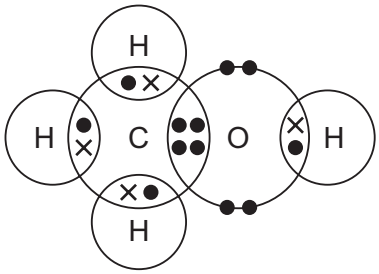

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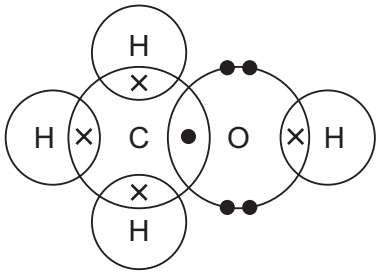


8 Rescuers are drilling through fallen rock in order to rescue some people trapped in a cave. The drill needs lubricating from time to time.

Four statements are made about the materials used for the drill tip and the lubricant to explain the reasons for their use.

1 Diamond is used for the drill tip as it does **not** conduct electricity.

2 Diamond is used for the drill tip as it is very hard.

3 Graphite is used as the lubricant as it conducts electricity.

4 Graphite is used as the lubricant as it is soft and slippery.

Which statements are correct?

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

9 Which compound has an empirical formula that is the same as its molecular formula?

A butane

B but-1-ene

C butanoic acid

D butan-1-ol

10 Which row identifies the charge on the chromium ion and on the sulfate ion in $Cr_2(SO_4)_3$?

	Cr	SO_4
A	2+	3–
B	2–	3+
C	3+	2–
D	3–	2+

11 Which statement describes a saturated solution?

A It is a solution that contains the maximum concentration of solute.

B It is a solution that contains the maximum amount of solvent.

C It is a hydrocarbon that contains both double and single bonds.

D It is a hydrocarbon that contains only single bonds.

12 Calcium carbonate decomposes when heated strongly.

$$CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$$

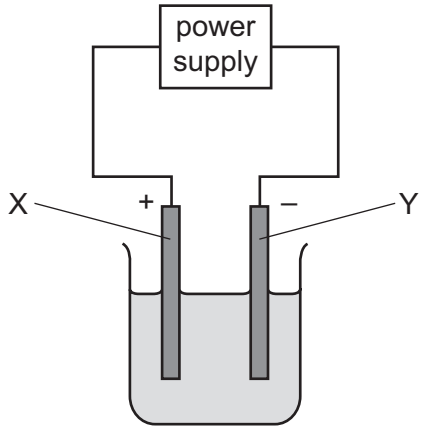
How many gaseous molecules are produced when 10.0 g of calcium carbonate is completely decomposed?

A 1.00×10^{22} **B** 1.20×10^{23} **C** 6.02×10^{22} **D** 6.02×10^{23}

13 Which product is initially obtained at each electrode during the electrolysis of concentrated aqueous sodium chloride?

	cathode	anode
A	hydrogen	chlorine
B	hydrogen	oxygen
C	sodium	chlorine
D	sodium	oxygen

14 Molten lead(II) bromide is electrolysed using inert electrodes.



Which statement describes the movement of electrons?

A from X to Y through the external wire

B from Y to X through the external wire

C from X to Y through the electrolyte

D from Y to X through the electrolyte

15 In a fuel cell, a fuel is oxidised to produce electricity.

Which row describes the fuel and the oxidising agent used?

	fuel	oxidising agent
A	nitrogen	oxygen
B	hydrogen	oxygen
C	nitrogen	water
D	hydrogen	water

16 Which statement about reactions is correct?

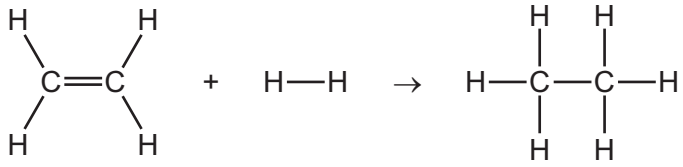
A A reaction that is vigorous at room temperature has a high activation energy.

B If ΔH for a reaction is positive, bond making in the formation of the products is endothermic.

C In an exothermic reaction, the energy required to break bonds is less than the energy released to make bonds.

D Reactions with a positive enthalpy change always transfer thermal energy to the surroundings.

17 Ethene reacts with hydrogen to form ethane.



The bond energies are shown in the table.

bond	bond energy in kJ / mol
C–C	+350
C–H	+410
H–H	+436
C=C	+614

What is the enthalpy change for the reaction?

A –290 kJ / mol

B –120 kJ / mol

C +120 kJ / mol

D +290 kJ / mol

18 Zinc reacts with dilute hydrochloric acid.

Which statement about the particles in the reaction is correct?

A Increasing the concentration of dilute hydrochloric acid increases the collision rate but has **no** effect on the activation energy.

B Increasing the concentration of dilute hydrochloric acid increases the collision rate and the activation energy.

C Increasing the temperature of the reaction increases the activation energy.

D Increasing the temperature of the reaction causes all collisions to lead to a reaction.

19 Ethanol is manufactured by the addition of steam to ethene.

$$C_2H_4(g) + H_2O(g) \rightleftharpoons C_2H_5OH(g)$$

The reaction conditions are 300 °C and 60 atm.

The forward reaction is exothermic.

Which rows describe the effect on the equilibrium yield of C_2H_5OH when the stated change is made?

	change	equilibrium yield of C_2H_5OH
1	adding a catalyst	no change
2	decreasing the temperature	increases
3	decreasing the pressure	increases

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

20 Which row identifies the conditions used to make sulfur trioxide in the Contact process?

	pressure / kPa	catalyst
A	200	iron
B	200	vanadium(V) oxide
C	20 000	iron
D	20 000	vanadium(V) oxide

21 Which statement describes a base?

A It reacts with ammonium chloride to produce ammonia gas.

B It reacts with calcium carbonate to produce carbon dioxide gas.

C It reacts with copper to produce hydrogen gas.

D It turns blue litmus red.

22 The equation shows the reaction between copper and concentrated nitric acid.

$$Cu(s) + 4HNO_3(aq) \rightarrow Cu(NO_3)_2(aq) + 2NO_2(g) + 2H_2O(l)$$

Which element is reduced in this reaction?

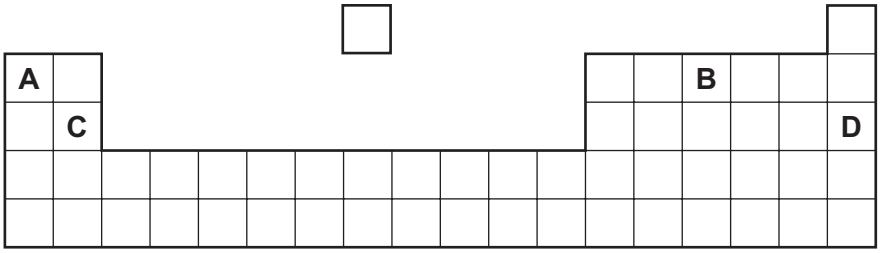
A oxygen

B nitrogen

C copper

D hydrogen

23 The Periodic Table shows the position of four different elements.



Which row is correct?

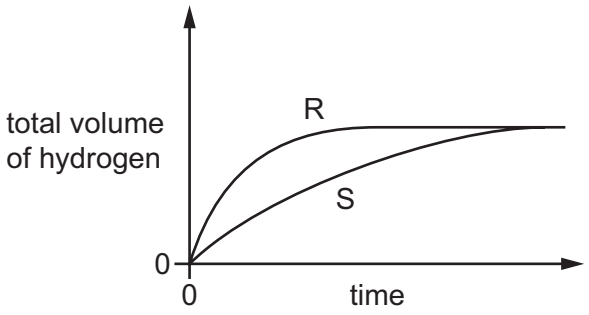
	element	number of electrons in the outer shell
A	non-metal	1
B	metal	5
C	metal	2
D	non-metal	7

24 Dilute acid R and dilute acid S have the same concentration.

The same volume of each dilute acid is reacted separately with the same mass of magnesium ribbon. Both reactions are carried out at room temperature and pressure.

The volume of hydrogen produced is measured.

A graph of the results is shown.



Which statement about the reactions is correct?

A Acid S reacts faster than acid R.

B The final volume of hydrogen produced in each reaction is different.

C Acid R is a stronger acid than acid S.

D Acid S is a stronger acid than acid R.

25 Which metal oxide reacts with aqueous sodium hydroxide to form a salt and water?

A calcium oxide

B copper(II) oxide

C sodium oxide

D aluminium oxide

26 Which row identifies a transition element?

	melting point	density at r.t.p.
A	high	high
B	high	low
C	low	high
D	low	low

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27 Which statement about Group I or Group VII elements is correct?

A Group VII elements are monatomic non-metals.

B Lithium is more reactive with water than caesium.

C The melting point of Group I metals increases down the group.

D Potassium bromide reacts with chlorine to produce an orange solution.

28 Some information about four metals P, Q, R and S is listed.

Metal P does **not** react with dilute hydrochloric acid.

Metal Q is more reactive than magnesium.

Metal R reacts rapidly with cold water to produce hydrogen.

Metal S reacts with dilute hydrochloric acid to produce hydrogen.

Which row identifies P, Q, R and S?

	P	Q	R	S
A	gold	aluminium	sodium	copper
B	copper	potassium	calcium	magnesium
C	silver	calcium	iron	zinc
D	magnesium	sodium	potassium	iron

29 Cars are fitted with catalytic converters.

Which equation represents a reaction that takes place in a catalytic converter?

A $CO_2 + NO_2 \rightarrow CO + NO + O_2$

B $2CO + 2NO \rightarrow 2CO_2 + N_2$

C $CO_2 + N_2 \rightarrow C + 2NO$

D $C + NO_2 \rightarrow CO + NO$

30 Three statements about greenhouse gases and global warming are listed.

1 A greenhouse gas molecule can absorb and emit thermal energy.

2 The Earth is a source of thermal energy.

3 Thermal energy emitted by a greenhouse gas molecule is sent out in all directions.

Which statements are correct?

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

31 Which type of reaction takes place when methane reacts with chlorine in the presence of ultraviolet light?

A addition

B cracking

C polymerisation

D substitution

32 Iron is extracted from iron(III) oxide in the blast furnace.

Three steps in the process are listed.

1 Carbon (coke) is completely oxidised.

2 Iron(III) oxide is reduced.

3 Carbon dioxide is reduced to carbon monoxide.

What is the correct order of the steps in the extraction of iron?

A $1 \rightarrow 2 \rightarrow 3$ **B** $1 \rightarrow 3 \rightarrow 2$ **C** $2 \rightarrow 1 \rightarrow 3$ **D** $3 \rightarrow 1 \rightarrow 2$

33 Three different reactions that occur during the extraction of aluminium from purified bauxite are listed.

1 $Al^{3+} + 3e^- \rightarrow Al$

2 $C + O_2 \rightarrow CO_2$

3 $2O^{2-} \rightarrow O_2 + 4e^-$

Which reactions occur at the anode?

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

34 Which statement about aqueous ethanoic acid is correct?

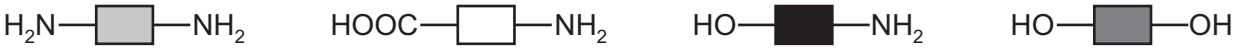
A It reacts with magnesium to form oxygen gas.

B It reacts with sodium carbonate to form carbon dioxide gas.

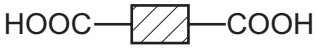
C It turns red litmus paper blue.

D It turns methyl orange yellow.

35 The diagrams represent four monomers.



The monomers each react in a 1 : 1 ratio with the dicarboxylic acid shown.

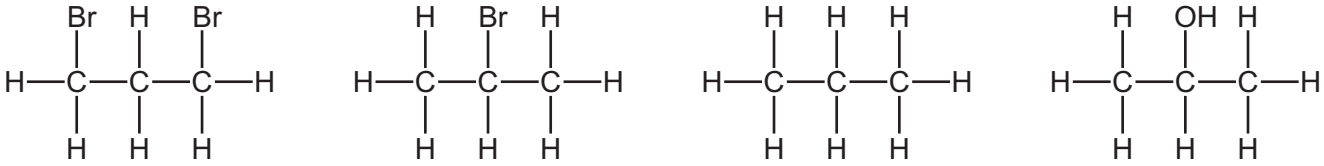


How many of the four monomers shown can react with the dicarboxylic acid to form a polymer?

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

36 Propene undergoes addition reactions with bromine, hydrogen and steam.

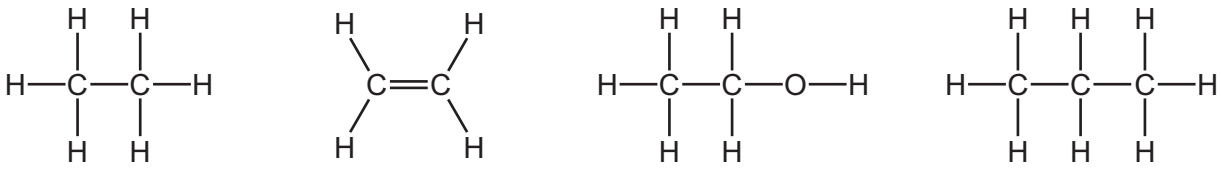
Which structures represent a product of these reactions?



1 2 3 4

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

37 The structures of four compounds are shown.



1 2 3 4

Which compounds are members of the same homologous series?

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

38 Which statement about ethanoic acid is correct?

A Ethanol is reduced by bacteria to produce ethanoic acid.

B Ethanoic acid reacts with magnesium to produce a salt of formula CH_3COOMg.

C Ethanoic acid and methanol react in the presence of an acid catalyst to produce ethyl methanoate.

D Ethanol reacts with acidified aqueous potassium manganate(VII) to produce ethanoic acid.

39 Substance X contains one cation.

Two tests are completed on aqueous X.

test 1 flame test

test 2 addition of aqueous sodium hydroxide dropwise and then in excess

Which row shows a possible combination of observations for the tests?

	observation for test 1	observation for test 2
A	yellow flame	white ppt., insoluble in excess
B	blue-green flame	light blue ppt., insoluble in excess
C	light green flame	green ppt., soluble in excess
D	red flame	red-brown ppt., insoluble in excess

40 A colourless mixture is separated by paper chromatography.

The steps below describe the method. These steps are **not** in the correct order.

1 Remove the chromatography paper from the solvent when the solvent front is near the top of the paper.

2 Place the chromatography paper in the solvent.

3 Spray the chromatography paper with a locating agent.

4 Place a spot of the mixture on the pencil line.

5 Draw a pencil line at the bottom of the chromatography paper.

6 Draw a pencil line to mark the position of the solvent front.

What is the correct order for these steps?

A $3 \rightarrow 5 \rightarrow 6 \rightarrow 4 \rightarrow 2 \rightarrow 1$

B $5 \rightarrow 4 \rightarrow 3 \rightarrow 2 \rightarrow 1 \rightarrow 6$

C $3 \rightarrow 5 \rightarrow 4 \rightarrow 1 \rightarrow 2 \rightarrow 6$

D $5 \rightarrow 4 \rightarrow 2 \rightarrow 1 \rightarrow 6 \rightarrow 3$

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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.).