Cambridge Assessment International Education

Cambridge IGCSE™

CHEMISTRY **0620/23**

Paper 2 Multiple Choice (Extended) **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.

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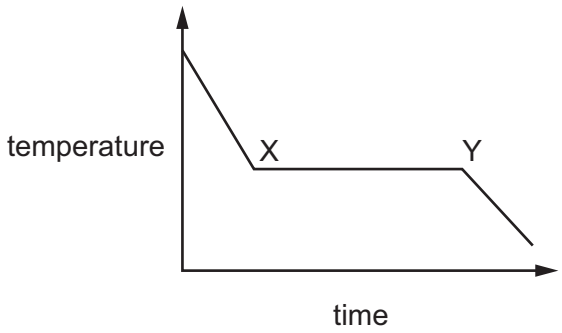
1 Which two changes, when applied **at the same time** to a fixed amount of gas, cause the greatest increase in volume of the gas?

	change in pressure	change in temperature
A	decrease by 10%	decrease by 10%
B	increase by 10%	decrease by 10%
C	decrease by 20%	increase by 10%
D	increase by 20%	increase by 10%

2 Solid G is heated until it melts. It is then left to cool to room temperature.

The graph shows the cooling curve for G.



Four statements about the cooling curve between X and Y are listed.

1 The speed of the molecules of G decreases.

2 The molecules of G become less closely packed.

3 Thermal energy is released by the molecules of G to the surroundings.

4 G changes from solid to liquid.

Which statements are correct?

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

3 Which atom has twice as many neutrons as protons?

A $^{1}_{1}H$ **B** $^{2}_{1}H$ **C** $^{3}_{1}H$ **D** $^{4}_{2}He$

4 What is the nucleon number of an atom?

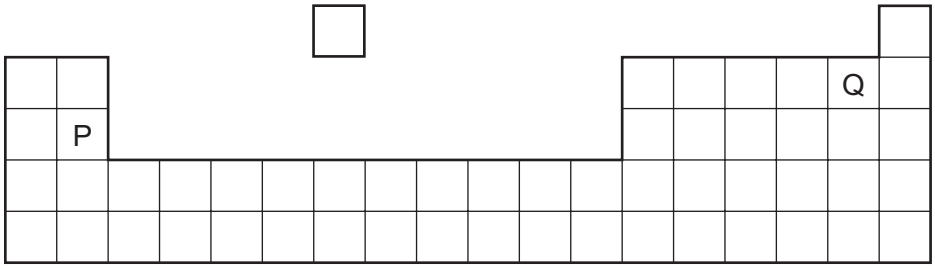
A the number of electrons, neutrons and protons in the nucleus

B the number of neutrons and protons in the nucleus

C the number of neutrons in the nucleus

D the number of protons in the nucleus

5 The diagram shows the positions of elements P and Q in the Periodic Table.



What is the formula of the compound that is formed between P and Q?

A PQ **B** P_2Q **C** PQ_2 **D** P_2Q_7

6 Which statement about ionic compounds is correct?

A Giant lattices are formed when ionic compounds crystallise from solution.

B In all ionic compounds, the metal ions have fewer electrons than the non-metal ions.

C In a giant lattice, ions of the same charge are closer together than ions of opposite charge.

D When ionic compounds melt, strong intermolecular forces are broken.

7 The equation for the reaction between iron(III) chloride and sodium hydroxide is shown.

$$FeCl_3(aq) + 3NaOH(aq) \rightarrow Fe(OH)_3(s) + 3NaCl(aq)$$

What is the ionic equation for this reaction?

A $Fe^{3+}(aq) + 3OH^-(aq) \rightarrow Fe^{3+}(s) + 3OH^-(s)$

B $Fe^{3+}(aq) + 3OH^-(aq) \rightarrow Fe(OH)_3(s)$

C $3Na^+(aq) + 3Cl^-(aq) \rightarrow 3Na^+(aq) + 3Cl^-(aq)$

D $3Na^+(aq) + 3Cl^-(aq) \rightarrow 3NaCl(aq)$

8 A compound is analysed and found to contain 85.7% carbon and 14.3% hydrogen only.

What is its empirical formula?

A CH **B** CH_2 **C** C_2H_4 **D** C_6H

9 Aqueous barium hydroxide, $Ba(OH)_2$, reacts with dilute nitric acid, HNO_3. The products are aqueous barium nitrate, $Ba(NO_3)_2$, and water.

In a titration, 15.2 cm^3 of 0.75 mol/dm^3 aqueous barium hydroxide is required to neutralise 20.0 cm^3 of dilute nitric acid.

What is the concentration of the nitric acid?

A 0.29 mol/dm^3

B 0.57 mol/dm^3

C 1.14 mol/dm^3

D 2.03 mol/dm^3

10 Which particles are responsible for the transfer of charge in the external circuit during the electrolysis of molten lead(II) bromide?

A anions

B atoms

C cations

D electrons

11 Two statements about hydrogen are listed.

1 Hydrogen is used as a fuel.

2 When hydrogen burns in the air to form water, thermal energy is produced.

Which conclusion about these statements is correct?

A Both statements are correct, and statement 2 explains statement 1.

B Both statements are correct, but statement 2 does **not** explain statement 1.

C Statement 1 is correct, but statement 2 is **not** correct.

D Statement 2 is correct, but statement 1 is **not** correct.

12 Concentrated aqueous copper(II) chloride is electrolysed using carbon electrodes.

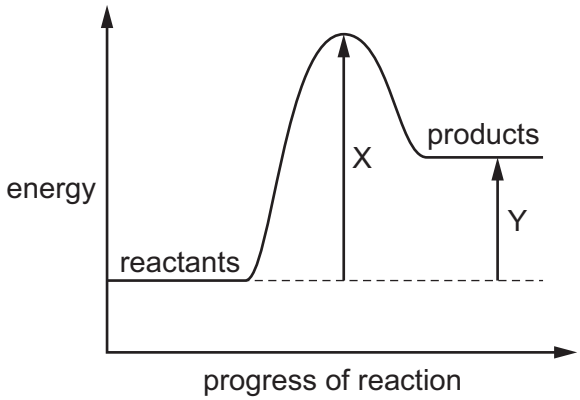
What is formed at each electrode?

	negative electrode	positive electrode
A	chlorine	copper
B	copper	chlorine
C	copper	oxygen
D	oxygen	copper

13 Which row describes an exothermic reaction?

	sign of enthalpy change, ΔH	temperature of the surroundings
A	positive	decreases
B	positive	increases
C	negative	decreases
D	negative	increases

14 A reaction pathway diagram is shown.



Which row shows the correct labels for X and Y and the type of reaction taking place?

	X	Y	type of reaction
A	enthalpy change	activation energy	exothermic
B	activation energy	enthalpy change	endothermic
C	activation energy	enthalpy change	exothermic
D	enthalpy change	activation energy	endothermic

15 The rate of reaction between magnesium and dilute hydrochloric acid is increased by increasing the concentration of the acid.

How does this affect the reacting particles?

	collision rate of particles	proportion of particles with sufficient energy to react
A	increases	increases
B	increases	stays the same
C	stays the same	increases
D	stays the same	stays the same

16 The reaction between aqueous iron(III) ions, Fe^{3+}, and aqueous thiocyanate ions, SCN^-, is reversible.

The equation for the reaction is shown.

$$Fe^{3+}(aq) + SCN^-(aq) \rightleftharpoons FeSCN^{2+}(aq)$$

yellow colourless red

At equilibrium, the concentrations of Fe^{3+} ions, SCN^- ions, and $FeSCN^{2+}$ ions are identical, and the mixture appears orange.

When a few drops of aqueous thiocyanate ions are added to the mixture, a new equilibrium forms.

How does the colour of the mixture change?

A It becomes colourless.

B It becomes a lighter orange.

C It becomes more yellow.

D It becomes more red.

17 The equation for the reaction between iron(II) sulfate and bromine is shown.

$$6FeSO_4 + 3Br_2 \rightarrow 2Fe_2(SO_4)_3 + 2FeBr_3$$

Which row identifies the oxidising agent and the reducing agent?

	oxidising agent	reducing agent
A	Br_2	$FeSO_4$
B	$FeSO_4$	Br_2
C	$FeBr_3$	$Fe_2(SO_4)_3$
D	$Fe_2(SO_4)_3$	$FeBr_3$

18 The equation represents a redox reaction.

$$2Al + Fe_2O_3 \rightarrow 2Fe + Al_2O_3$$

What is the change in the oxidation number of iron in this reaction?

A from +2 to +3

B from +2 to 0

C from +3 to +2

D from +3 to 0

19 Aqueous ammonia forms an equilibrium with water.

$$NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$$

In this equilibrium, which particle acts as an acid and which particle acts as a base?

	acid	base
A	NH_3	H_2O
B	NH_3	OH^-
C	H_2O	NH_3
D	H_2O	NH_4^+

20 Which row identifies an acidic oxide, a basic oxide and an amphoteric oxide?

	acidic	basic	amphoteric
A	ZnO	SO_2	Al_2O_3
B	SO_2	Al_2O_3	Na_2O
C	ZnO	Al_2O_3	SO_2
D	SO_2	Na_2O	Al_2O_3

21 A Group I metal (lithium or potassium) is reacted with a Group VII element (chlorine or iodine).

Which compound is formed when the Group I metal of highest density reacts with the Group VII element of lowest density?

A potassium chloride

B lithium chloride

C potassium iodide

D lithium iodide

22 Element X is in the same group of the Periodic Table as silicon.

An atom of element X has more protons than a silicon atom.

Which element could be X?

A aluminium

B carbon

C germanium

D phosphorus

23 Which statement about the elements in Group VIII is correct?

A They all form diatomic molecules.

B They all have eight electrons in their outer electron shells.

C They all react with oxygen to form oxides.

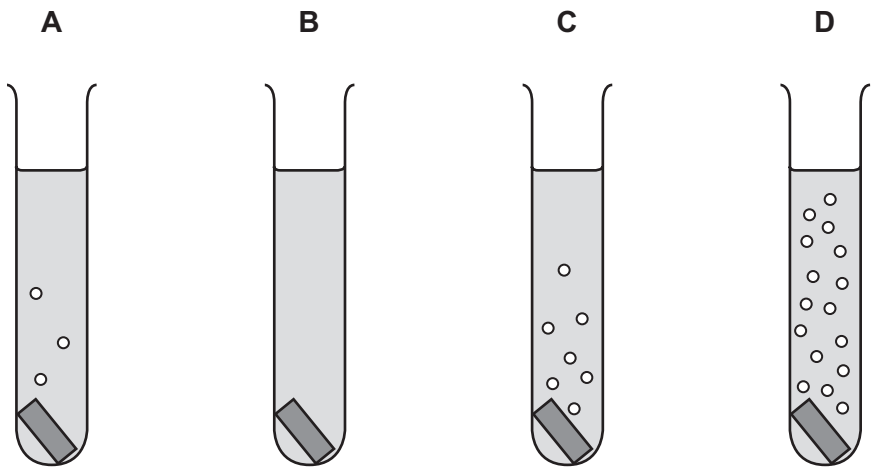
D They all are gases at room temperature.

24 Which element is a transition element?

	melting point in °C	density at r.t.p. in g/cm^3	colour of oxide at r.t.p.
A	98	1.0	white
B	328	11.3	yellow
C	651	1.7	white
D	1907	7.2	green

25 Four test-tubes contain dilute hydrochloric acid. Each test-tube has one piece of a different metal added to it. The metals are copper, iron, magnesium and zinc.

Which test-tube contains iron and dilute hydrochloric acid?



26 Brass is a mixture of copper and zinc.

Which statement describes and explains the relative strength of brass compared to copper?

A Brass is stronger than copper because the layers of atoms in brass **cannot** easily slide over each other.

B Brass is stronger than copper because the intermolecular forces are greater in brass than in copper.

C Brass is weaker than copper because the layers of atoms slide more easily over each other in brass than in copper.

D Brass is weaker than copper because the intermolecular forces are weaker in brass than in copper.

27 A sample of calcium carbonate is heated strongly, and substances U and V are formed.

Substance U is a white solid. Substance V is a colourless gas.

What are substances U and V?

	U	V
A	calcium chloride	oxygen
B	calcium hydroxide	carbon dioxide
C	calcium oxide	carbon dioxide
D	calcium sulfate	oxygen

28 A sample of water taken from a river contains harmful microbes.

What is a source of harmful microbes in the river water?

A sewage

B fertilisers

C detergents

D plastics

29 Anhydrous copper(II) sulfate and anhydrous cobalt(II) chloride change colour when water is added to them.

Which row shows the correct colour changes?

	copper(II) sulfate	cobalt(II) chloride
A	blue to white	blue to pink
B	blue to white	pink to blue
C	white to blue	blue to pink
D	white to blue	pink to blue

30 Which gas contributes to increased global warming?

A argon

B carbon dioxide

C nitrogen

D oxygen

31 Which statement describes how greenhouse gases increase global warming?

A Greenhouse gases absorb thermal energy from the Sun, reducing the Earth's temperature.

B Greenhouse gases reflect thermal energy back into space, cooling the Earth's surface.

C Greenhouse gases absorb and re-emit thermal energy radiated from the Earth's surface.

D Greenhouse gases release thermal energy from the Earth into space.

32 Nitrogen monoxide is produced in a car engine when petrol is burned.

The gases from the car engine are passed through a catalytic converter.

In the catalytic converter, the nitrogen monoxide, NO, reacts with carbon monoxide, CO, to form nitrogen and carbon dioxide.

Which statement is **not** correct?

A Carbon monoxide is oxidised in the catalytic converter.

B Carbon monoxide is produced by the complete combustion of petrol.

C Nitrogen monoxide is formed by the reaction of nitrogen and oxygen.

D Nitrogen monoxide is reduced in the catalytic converter.

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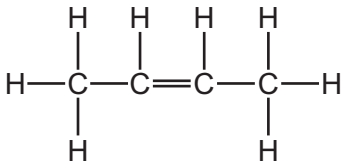
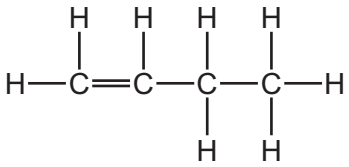
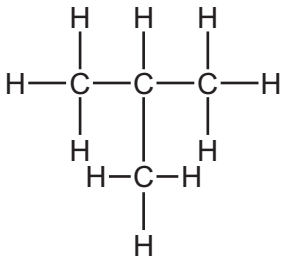
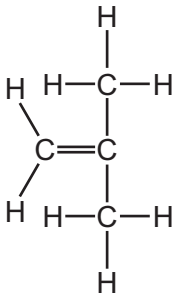
33 The displayed formula of but-2-ene is shown.



Which displayed formulae represent structural isomers of but-2-ene?

		
1	2	3

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

34 Which row describes two characteristics of members of the same homologous series?

	characteristic 1	characteristic 2
A	same functional group	trend in physical properties
B	same physical properties	same functional group
C	same general formula	different chemical properties
D	differing from one member to the next by a CH_3 unit	similar chemical properties

35 Compound W is a hydrocarbon that contains single bonds only.

Which homologous series contains W?

A alkenes

B alkanes

C carboxylic acids

D alcohols

36 Methane forms chloromethane in a photochemical reaction using ultraviolet light.

Which statement about this reaction is correct?

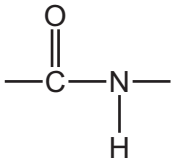
A Methane is mixed with hydrogen chloride gas, and ultraviolet light prevents a combustion reaction.

B Methane is mixed with hydrogen chloride gas, and ultraviolet light provides the activation energy for the reaction.

C Methane is mixed with chlorine gas, and ultraviolet light prevents a combustion reaction.

D Methane is mixed with chlorine gas, and ultraviolet light provides the activation energy for the reaction.

37 Which statement about polymers is correct?

A Nylon contains the  linkage.

B Nylon is a polyester.

C Propane can be polymerised by addition polymerisation.

D The linkage in PET contains a carbon–carbon double bond.

38 The steps used to separate a mixture of a soluble solid and an insoluble solid are listed.

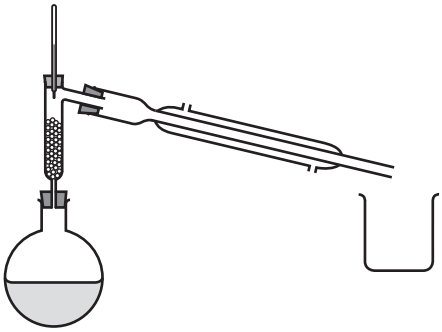
- A solution is made by adding the mixture to a suitable .....1..... .
- The mixture is stirred and then poured through a filter funnel lined with filter paper.
- The insoluble solid is collected on the filter paper as the .....2..... .

Which words complete gaps 1 and 2?

	1	2
A	solute	filtrate
B	solute	residue
C	solvent	filtrate
D	solvent	residue

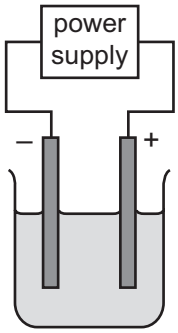
39 Which items of apparatus are used to separate a mixture of liquids with different boiling points?

A

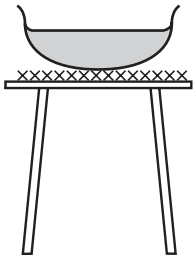


B

C



D



40 In paper chromatography, what is the equation for the R_f value?

A $R_f = \dfrac{\text{distance travelled by solvent}}{\text{distance travelled by substance}}$

B $R_f = \dfrac{\text{distance travelled by locating agent}}{\text{distance travelled by substance}}$

C $R_f = \dfrac{\text{distance travelled by substance}}{\text{distance travelled by locating agent}}$

D $R_f = \dfrac{\text{distance travelled by substance}}{\text{distance travelled by solvent}}$

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The Periodic Table of Elements

Key

atomic number
atomic symbol
name
relative atomic mass

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 –

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.).