Cambridge Assessment International Education

Cambridge O Level

CHEMISTRY **5070/12**

Paper 1 Multiple Choice **October/November 2025**

1 hour

You must answer on the multiple choice answer sheet.

4936830405

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 Separate samples of water and air each have a volume of 30 cm^3 at room temperature and pressure.

The pressure applied to both samples is increased by the same amount at room temperature.

Which row describes the volumes at the increased pressure?

	volume of water / cm^3	volume of air / cm^3
A	20	3
B	20	300
C	30	3
D	30	300

2 Why does a balloon full of helium gas become smaller as the temperature changes from 30 °C to 10 °C?

A The gas condenses to a liquid and so takes up less space.

B The gas particles become smaller at lower temperatures.

C The gas particles diffuse through the balloon and escape.

D The gas particles move more slowly so reducing the pressure.

3 Atom X has an atomic number of 19 and a nucleon number of 42.

Atom Y has an atomic number of 20 and a nucleon number of 40.

Which statement is correct?

A Atom X contains two more electrons than atom Y.

B Atom X contains three more neutrons than atom Y.

C Atom Y contains one more neutron than atom X.

D X and Y are atoms of the same element.

4 In which ionic compound do all the ions have the same electronic configuration?

A beryllium sulfide

B lithium fluoride

C magnesium chloride

D sodium oxide

5 Which ion has a positive charge?

A ammonium

B carbonate

C manganate(VII)

D sulfite

6 Which row is correct?

	structure and bonding of hydrogen chloride	structure and bonding of diamond
A	giant covalent	giant covalent
B	giant covalent	simple molecular
C	simple molecular	giant covalent
D	simple molecular	simple molecular

7 Powdered calcium carbonate reacts with dilute hydrochloric acid to produce calcium chloride, water and carbon dioxide.

What is the correct ionic equation, including state symbols, for this reaction?

A $CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$

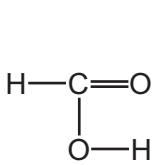
B $CaCO_3(s) + 2H^+(aq) \rightarrow Ca^{2+}(aq) + H_2O(l) + CO_2(g)$

C $Ca^{2+}(aq) + CO_3^{2-}(aq) + 2H^+(aq) \rightarrow Ca^{2+}(aq) + H_2O(l) + CO_2(g)$

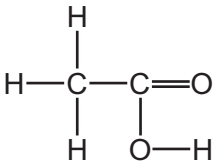
D $CO_3^{2-}(aq) + 2H^+(aq) \rightarrow H_2O(l) + CO_2(g)$

8 Which structure shows the carboxylic acid with the lowest relative molecular mass?

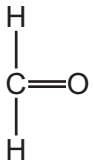
A



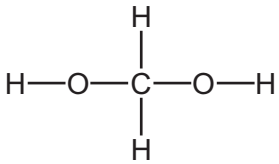
B



C



D



9 A mixture of 2 g of hydrogen and 32 g of oxygen occupies a volume, *V*, measured at r.t.p.

The gases react until there is no further change.

$$2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$$

Which reactant is in excess and what is the final volume of the mixture measured at r.t.p.?

	reactant in excess	final volume
A	hydrogen	$\frac{V}{4}$
B	hydrogen	$\frac{V}{2}$
C	oxygen	$\frac{V}{4}$
D	oxygen	$\frac{V}{2}$

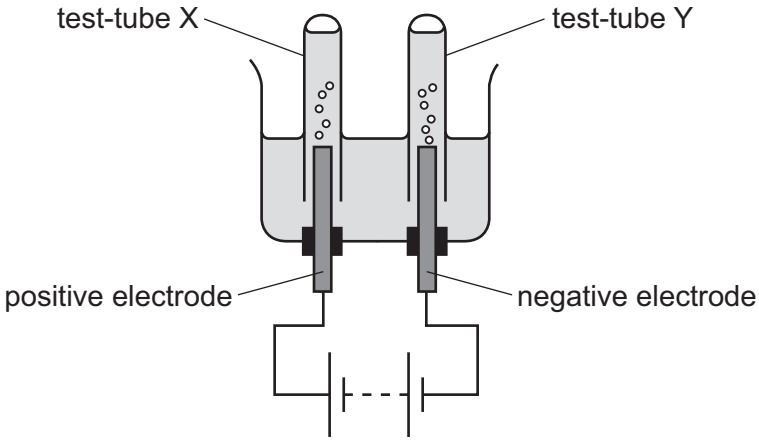
10 A chemist prepares calcium nitrate. They start with 8.00 g of pure calcium oxide and an excess of dilute nitric acid. They produce 12.65 g of pure, dry anhydrous calcium nitrate crystals.

What is the percentage yield of calcium nitrate?

[relative atomic masses, A_r: Ca, 40; N, 14; H, 1; O, 16]

A 54.0 **B** 63.2 **C** 67.1 **D** 86.8

11 The apparatus shown is used to investigate the electrolysis using inert electrodes of dilute sulfuric acid and concentrated aqueous sodium chloride in separate experiments.



Which row shows the ratio of volume of gas collected in each test-tube?

	ratio of volume of gas in X and Y with dilute H_2SO_4 X : Y	ratio of volume of gas in X and Y with concentrated aqueous NaCl X : Y
A	1 : 2	2 : 1
B	1 : 1	1 : 1
C	1 : 2	1 : 1
D	2 : 1	1 : 2

12 Which statement about reactions is correct?

A A reaction in which the number of bonds broken equals the number of bonds formed always has an enthalpy change, $\Delta H = 0$.

B Combustion can be either exothermic or endothermic.

C In exothermic reactions, thermal energy is transferred to the surroundings, so the temperature of the surroundings increases.

D The activation energy, E_a, for a reaction is the minimum energy particles must have in order to collide.

13 The word equations for two reactions of ethene are shown.

reaction 1 ethene + hydrogen → ethane

reaction 2 ethene + bromine → 1,2-dibromoethane

The bond energies of the bonds involved in the reactions are shown in the table.

	bond energy in kJ / mol
C=C	612
C–C	347
C–H	413
H–H	436
Br–Br	193
C–Br	290

What is the value of ($\Delta H_{reaction1} - \Delta H_{reaction2}$)?

A +240 kJ / mol **B** +3 kJ / mol **C** –3 kJ / mol **D** –246 kJ / mol

14 Two changes are described.

change 1 Copper is added to concentrated nitric acid. Nitrogen dioxide is produced.

change 2 Concentrated sulfuric acid is added to sugar. The change that occurs **cannot** be reversed.

Which row is correct?

	change 1	change 2
A	chemical change	chemical change
B	chemical change	physical change
C	physical change	chemical change
D	physical change	physical change

15 Which change increases the rate of a chemical reaction?

A using a higher pressure in a gaseous reaction

B using a lower temperature

C using a more dilute solution

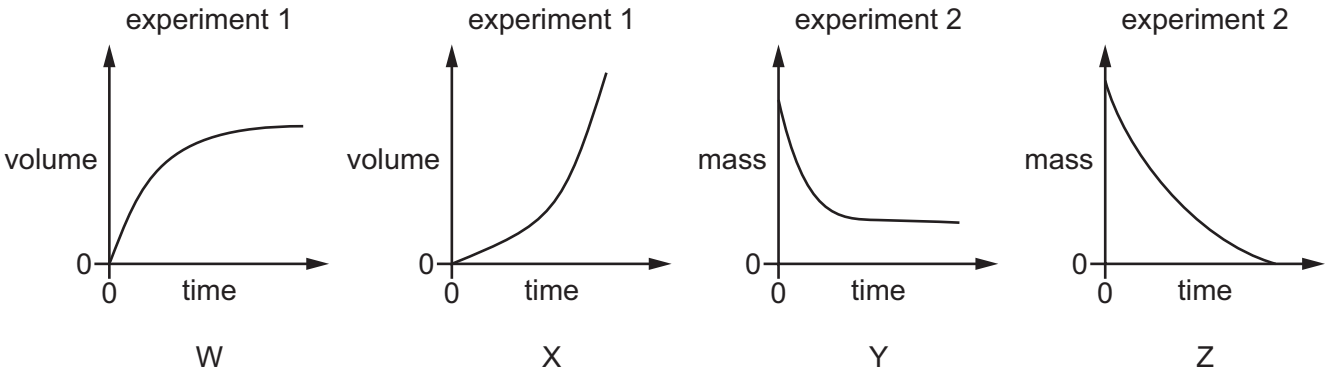
D using larger pieces of a solid

16 In two separate experiments, 1 and 2, an excess of powdered calcium carbonate reacts in a flask with dilute hydrochloric acid.

In experiment 1, the volume of carbon dioxide evolved is measured at regular time intervals.

In experiment 2, the mass of the flask and its contents is measured at regular time intervals.

The results of both experiments are plotted on graphs.



Which graphs show the results of these two experiments?

	experiment 1	experiment 2
A	W	Y
B	W	Z
C	X	Y
D	X	Z

17 Which statements about the Haber process for the manufacture of ammonia are correct?

1 At equilibrium, the concentrations of the reactants and products are no longer changing.

2 Increasing the pressure moves the position of equilibrium to the right.

3 Increasing the temperature moves the position of equilibrium to the left.

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

18 Acidified aqueous potassium manganate(VII) is used as a test reagent.

When it is added to an aqueous solution of compound M, the colour of the test reagent changes from .....1..... . This colour change shows that M is .....2..... .

Which words correctly complete gaps 1 and 2?

	1	2
A	colourless to purple	oxidised
B	colourless to purple	reduced
C	purple to colourless	oxidised
D	purple to colourless	reduced

19 In a neutralisation reaction, which change in particles occurs?

A atoms → molecules

B ions → molecules

C atoms → ions

D ions → atoms

20 Which pair of substances are both insoluble in water?

A ammonium chloride and ammonium carbonate

B copper carbonate and copper hydroxide

C lead nitrate and lead chloride

D zinc sulfate and zinc hydroxide

21 The atomic number of element X is 12.

What is the formula of the chloride of X?

A XCl **B** XCl_2 **C** XCl_4 **D** X_2Cl

22 Elements P, Q, R and S are in either Group I or Group VII of the Periodic Table.

P is a liquid at r.t.p.

Q is a gas at r.t.p.

Elements R and S both form basic oxides.

Element R has a higher melting point than element S.

Which pair of elements gives the most vigorous reaction?

A P and R **B** P and S **C** Q and R **D** Q and S

23 Three statements about noble gases are listed.

1 Their atoms all have eight electrons in the outer shell.

2 They are unreactive because their outer shells are full.

3 They are diatomic.

Which statements are correct?

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

24 Solid 1 and solid 2 are both elements.

Solid 1 is **not** malleable.

Solid 2 is ductile.

Which statement is correct?

A Solid 1 has good electrical conductivity only when molten.

B Solid 2 has good electrical conductivity only when molten.

C The layers of ions in solid 1 can slide over one another.

D The layers of ions in solid 2 can slide over one another.

25 When a piece of aluminium is placed in cold, dilute hydrochloric acid, no reaction is observed initially.

What is the reason for this?

A Aluminium contains small amounts of a more reactive metal that reacts with the acid instead.

B Aluminium is above hydrogen in the reactivity series.

C Aluminium is amphoteric and will only react with bases.

D Aluminium is coated with an oxide layer that prevents the acid getting to the metal.

26 A piece of zinc is attached to a steel car to prevent it from rusting.

Which statement is correct?

A A piece of copper is more effective than zinc because copper does **not** rust.

B A piece of magnesium is more effective than zinc because magnesium is less reactive than zinc.

C The piece of zinc provides a barrier around the entire steel car.

D The piece of zinc provides sacrificial protection to the steel car.

27 Which statement about the extraction of iron from hematite in the blast furnace is correct?

A Coke is reduced to carbon dioxide producing thermal energy to heat the furnace.

B Hematite contains iron(III) oxide which is reduced by carbon monoxide.

C Limestone is added to the blast furnace and is a substance that consists mainly of calcium oxide.

D Molten slag is formed from a reaction between hematite and silicon(IV) oxide.

28 Water may contain many substances before it is purified for drinking. Three substances are listed.

1 dissolved oxygen

2 harmful microbes

3 insoluble solids

Which substances are removed by the treatment of the domestic water supply?

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

29 Dry air is a mixture of gases. 99% of the mixture is nitrogen and oxygen.

What is in the highest abundance in the remaining 1%?

A argon

B chlorine

C hydrogen

D water vapour

30 Which statement about alkanes is correct?

A Ethane reacts with chlorine in an addition reaction.

B Propane has a higher boiling point than butane.

C The molecule of the alkane that contains 99 carbon atoms has 200 hydrogen atoms.

D There are three isomers with the formula C_4H_{10}.

31 Compound X is an alcohol containing only three carbon atoms. Compound Y is an alcohol containing only four carbon atoms.

Both compounds have the general formula $C_nH_{2n+1}OH$.

Which row shows the numbers of structural isomers of compounds X and Y that are unbranched alcohols?

	X	Y
A	1	2
B	2	2
C	2	3
D	1	3

32 Which two compounds react together to form $CH_3CH_2COOCH_3$?

A ethanoic acid and ethanol

B methanoic acid and ethanol

C methanoic acid and propanol

D propanoic acid and methanol

33 Three statements about fuels are listed.

1 Fossil fuels include coal, natural gas and wood.

2 Petroleum is a mixture of hydrocarbons.

3 Naphtha is used as a chemical feedstock.

Which statements are correct?

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

34 Which statement about propene is correct?

A Propene is a saturated hydrocarbon because it has a double carbon–carbon bond in its molecule.

B Propene is the third member of the homologous series of alkenes.

C Propene reacts with bromine in a substitution reaction that results in the rapid decolourisation of the bromine.

D Propene reacts with hydrogen in the presence of a nickel catalyst to produce propane.

35 Copper(II) oxide reacts with dilute ethanoic acid.

Which equation for this reaction is correct?

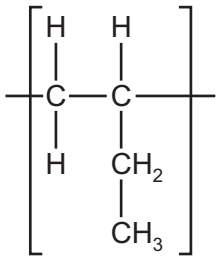
A $CuO + CH_3COOH \rightarrow CH_3COOCu + H_2$

B $CuO + CH_3COOH \rightarrow CH_3COOCu + H_2O$

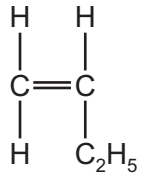
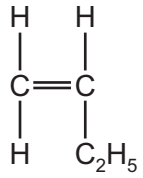
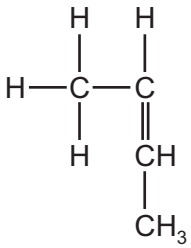
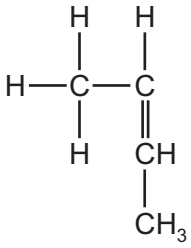
C $CuO + 2CH_3COOH \rightarrow (CH_3COO)_2Cu + H_2$

D $CuO + 2CH_3COOH \rightarrow (CH_3COO)_2Cu + H_2O$

36 The diagram shows the repeat unit of a polymer.



Which row shows the monomer and type of polymerisation involved in making this polymer?

	monomer	type of polymerisation
A		addition
B		condensation
C		addition
D		condensation

37 Which piece of apparatus is used to measure the volume of acid required to neutralise 25.0 cm^3 of alkali in a titration?

A beaker

B burette

C measuring cylinder

D volumetric pipette

38 A mixture contains two solids, X and Y, and no other substances. X and Y are both soluble in water.

The student separates X and Y using two steps.

step 1 The student stirs the mixture into a beaker of cold water.

What is step 2?

A chromatography

B crystallisation

C distillation

D filtration

39 Solid J contains cations and chloride ions. The aqueous solution of J is colourless. Two separate samples of the solution are tested.

Aqueous sodium hydroxide added to the first sample produces a white precipitate.

Aqueous ammonia added to the second sample produces a white precipitate.

Which statement about J is correct?

A The cation in J **must** be Al^{3+}.

B The cation in J **must** be Fe^{2+}.

C When dilute nitric acid and then aqueous barium nitrate are added to an aqueous solution of J, a white precipitate is formed.

D When dilute nitric acid and then aqueous silver nitrate are added to an aqueous solution of J, a white precipitate is formed.

40 Solid Q reacts with dilute hydrochloric acid, producing a gas that turns limewater milky.

Warming solid Q with aqueous sodium hydroxide produces a gas that turns damp red litmus paper blue.

What is solid Q?

A ammonium carbonate

B ammonium nitrate

C calcium carbonate

D calcium nitrate

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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.).