Cambridge Assessment International Education

Cambridge O Level

CHEMISTRY **5070/11**

Paper 1 Multiple Choice **May/June 2025**

1 hour

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.

IB25 06_5070_11/3RP

[Turn over

1 Four gases are listed.

1 CH_4

2 NH_3

3 CO_2

4 N_2

What is the order of their rate of diffusion at room temperature and pressure?

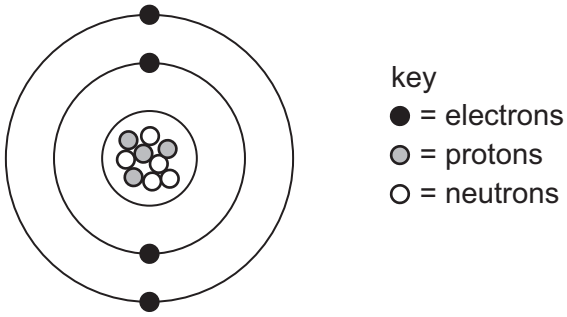
	slowest →			fastest
A	1	2	4	3
B	2	1	3	4
C	3	4	2	1
D	4	1	3	2

2 Sodium is added to water and a chemical reaction occurs. Hydrogen and aqueous sodium hydroxide are produced.

Which row describes the reactants and products in this reaction?

	reactants and products that are elements	reactants and products that are compounds	reactants and products that are mixtures
A	hydrogen	water and sodium	aqueous sodium hydroxide
B	hydrogen and sodium	water	aqueous sodium hydroxide
C	aqueous sodium hydroxide	hydrogen and sodium	water
D	sodium and water	aqueous sodium hydroxide	hydrogen

3 An atom of element X is shown.



Which element is X?

A beryllium

B boron

C carbon

D magnesium

4 Which definition of isotopes is correct?

A atoms of different elements that have the same number of electrons

B atoms of different elements that have the same number of neutrons

C atoms of the same element that have different numbers of electrons

D atoms of the same element that have different numbers of neutrons

5 A pure sample of element X has a relative atomic mass of 51.8.

The sample consists of three isotopes.

The table shows the relative masses and percentage abundances of two of the isotopes.

relative mass of isotope	percentage abundance of isotope
50	40
55	20

What is the relative mass of the third isotope?

A 51 **B** 52 **C** 53 **D** 54

6 Magnesium reacts with oxygen to form magnesium oxide.

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

Which row is correct?

	structure of Mg	structure of O_2	Mg^{2+}	O^{2-}
A	giant lattice	simple molecules	anion	cation
B	simple molecules	giant lattice	anion	cation
C	giant lattice	simple molecules	cation	anion
D	simple molecules	giant lattice	cation	anion

7 Which statement about solid calcium chloride is correct?

A It conducts electricity.

B It has a low melting point.

C It has an ionic lattice structure.

D It is insoluble in water.

8 Which description of metallic bonding is correct?

A the electrostatic attraction between negative ions in a lattice and a ‘sea’ of electrons

B the electrostatic attraction between negative ions in a lattice and a ‘sea’ of protons

C the electrostatic attraction between positive ions and negative ions in a lattice

D the electrostatic attraction between positive ions in a lattice and a ‘sea’ of electrons

9 The ions Ca^{2+} and PO_4^{3-} combine to form an ionic compound.

What is the formula of the compound?

A Ca_2PO_4 **B** $Ca(PO_4)_3$ **C** $Ca_2(PO_4)_3$ **D** $Ca_3(PO_4)_2$

10 Magnesium reacts with aqueous copper(II) sulfate to form copper and aqueous magnesium sulfate.

What is the correct equation for this reaction?

A $Mg + CuSO_4 \rightarrow Cu + MgSO_4$

B $Mg + Cu_2SO_4 \rightarrow 2Cu + MgSO_4$

C $2Mg + CuSO_4 \rightarrow Cu + Mg_2SO_4$

D $2Mg + Cu_2SO_4 \rightarrow 2Cu + Mg_2SO_4$

11 An organic compound has an M_r of 88.

What is the molecular formula of this compound?

A $C_{10}H_{20}O$ **B** $C_5H_{10}O$ **C** $C_4H_8O_2$ **D** C_2H_4O

12 $10\,cm^3$ of hydrogen gas is mixed with $x\,cm^3$ of chlorine gas. The equation for the reaction that takes place is shown.

$$H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$$

All the hydrogen reacts. The total volume of gas at the end of the reaction is $40\,cm^3$.

All measurements are at room temperature and pressure.

What is the value of x?

A $10\,cm^3$ **B** $20\,cm^3$ **C** $30\,cm^3$ **D** $40\,cm^3$

13 $100\,cm^3$ of aqueous potassium hydroxide with a concentration of $1.00\,mol/dm^3$ reacts with excess dilute sulfuric acid.

$$2KOH(aq) + H_2SO_4(aq) \rightarrow K_2SO_4(aq) + 2H_2O(l)$$

3.48 g of pure anhydrous potassium sulfate is produced.

What is the percentage yield of potassium sulfate?

A 5% **B** 10% **C** 20% **D** 40%

14 Which statement about electrolysis is correct?

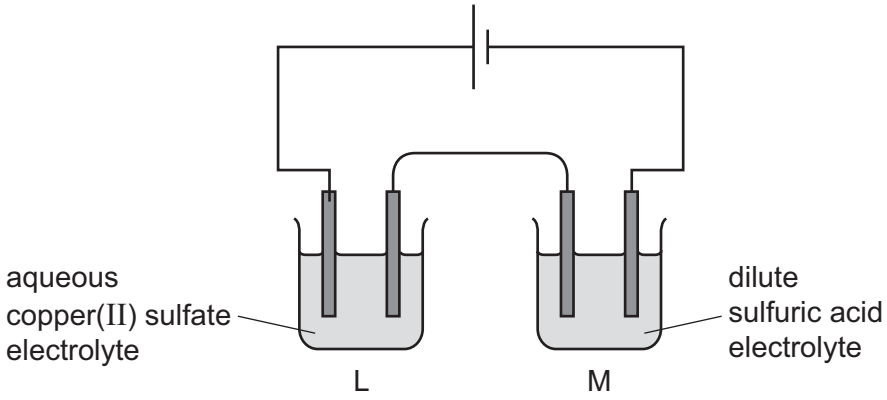
A Negative anions move towards the positive cathode.

B Negative cations move towards the positive cathode.

C Positive anions move towards the negative cathode.

D Positive cations move towards the negative cathode.

15 The diagram shows an electrolysis experiment using inert electrodes.



Which row shows what happens to the concentration of the electrolyte in L and in M as the electrolysis proceeds?

	L	M
A	✗	✗
B	✗	✓
C	✓	✗
D	✓	✓

key

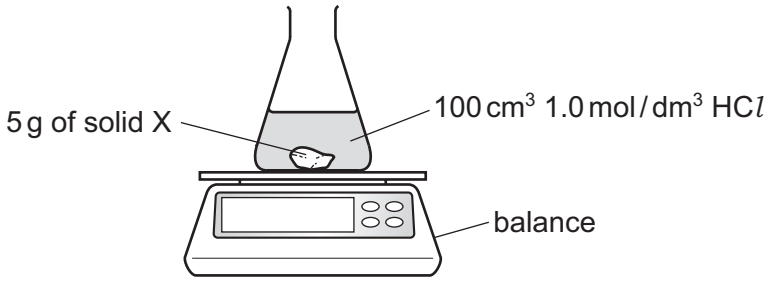
✓ = concentration stays constant

✗ = concentration does not stay constant

16 Which row is correct for a chemical reaction in which ΔH is negative?

	bond energy change	type of reaction
A	energy of bonds broken greater than energy of bonds formed	endothermic
B	energy of bonds broken less than energy of bonds formed	exothermic
C	energy of bonds broken greater than energy of bonds formed	exothermic
D	energy of bonds broken less than energy of bonds formed	endothermic

17 The diagram shows apparatus used to investigate two different reactions that produce gases.



The reactants for each experiment are mixed and the mass of flask plus contents for each experiment is recorded every 30 seconds.

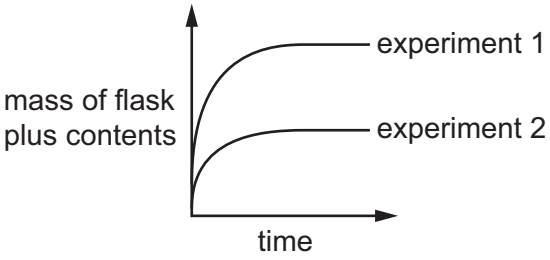
A graph of the mass against time is drawn.

In experiment 1, solid X is calcium carbonate.

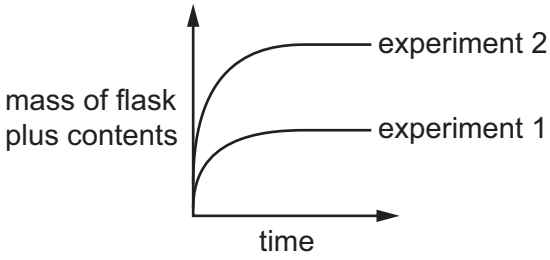
In experiment 2, solid X is magnesium.

Which graph is correct?

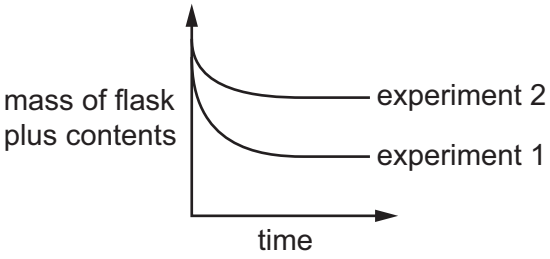
A



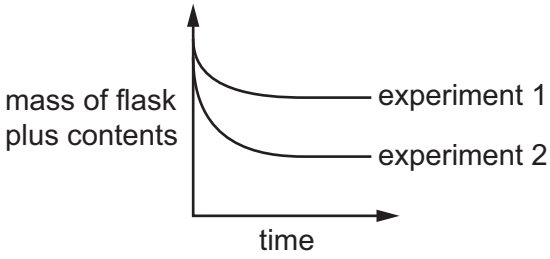
B



C



D



18 In a closed flask, gases Q and R reach a dynamic equilibrium.

$$Q(g) \rightleftharpoons 2R(g) \qquad \Delta H \text{ is positive}$$

Which change will move the equilibrium to the right?

A adding a catalyst

B decreasing the temperature

C increasing the pressure

D increasing the volume of the flask

19 Which row shows the typical conditions used for the conversion of sulfur dioxide to sulfur trioxide in the Contact process?

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

20 The pH of dilute ethanoic acid is measured. The equation for the partial dissociation of ethanoic acid is shown.

$$CH_3COOH(aq) \rightleftharpoons CH_3COO^-(aq) + H^+(aq)$$

Aqueous sodium ethanoate, CH_3COONa, is added to the dilute ethanoic acid and the pH is measured again.

What is the initial pH of the dilute ethanoic acid and how does it change after the addition of the aqueous sodium ethanoate?

	initial pH	change in pH after adding aqueous sodium ethanoate
A	3–4	increases
B	3–4	decreases
C	8–9	increases
D	8–9	decreases

21 Which element reacts with oxygen to produce an amphoteric oxide?

A carbon

B copper

C sulfur

D zinc

22 Element X is in Period 2 of the Periodic Table. X reacts with magnesium to form an ionic compound with the formula MgX_2.

What is X?

A chlorine

B fluorine

C oxygen

D sulfur

23 Rubidium is an element in Group I of the Periodic Table.

Which statement about rubidium is correct?

A It has a higher melting point than potassium.

B It reacts with water to produce an acidic solution.

C It reacts with water to produce oxygen gas.

D It is more reactive than potassium.

24 Which statement is correct?

A Noble gases are unreactive because they all have eight electrons in their outer shells.

B The Group VII element astatine, At_2, is expected to be a black solid at room temperature.

C The reactivity of the elements in both Group I and Group VII increases down the group.

D When aqueous chlorine is added to aqueous potassium bromide, there is no change in colour.

25 M is a metal that forms coloured compounds.

M is extracted from its oxide either by heating with carbon or by electrolysis.

M reacts with dilute hydrochloric acid.

What is M?

A copper or magnesium

B copper only

C iron or magnesium

D iron only

26 Which statement about brass is correct?

A It is a compound.

B It is an alloy.

C It is an isomer.

D It is an isotope.

27 Iron is galvanised with zinc to prevent rusting.

Which type of protection is provided by galvanising?

A alloy formation

B barrier and sacrificial

C barrier only

D sacrificial only

28 Iron is extracted from its ore hematite in a blast furnace.

Which statement about this extraction process is correct?

A Air is blown into the blast furnace to react with carbon.

B At the bottom of the blast furnace, a layer of molten iron floats on top of a layer of molten slag.

C Limestone is decomposed in the blast furnace to produce carbon monoxide.

D Silicon dioxide, an impurity in the ore, is a basic oxide.

29 Chlorine and carbon are both used in the treatment of the domestic water supply.

Which row describes one reason for the use of each substance?

	chlorine	carbon
A	causes the sedimentation of some solids	removes tastes from the water
B	causes the sedimentation of some solids	removes dissolved oxygen from the water
C	kills some microbes	removes tastes from the water
D	kills some microbes	removes dissolved oxygen from the water

30 Which row states an adverse effect for the named pollutant?

	air pollutant	adverse effect
A	carbon dioxide	increases plant growth
B	methane	causes cancer
C	oxides of nitrogen	photochemical smog
D	particulates	acid rain

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

1 Global warming is occurring because more of the Earth's thermal energy is released to space.

2 Greenhouse gases both absorb and emit thermal energy.

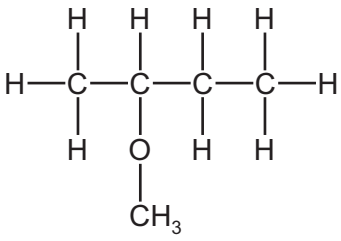
3 Greenhouse gas levels in the atmosphere may be reduced by replacing fossil fuels with hydrogen.

Which statements are correct?

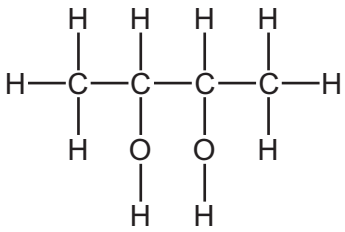
A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

32 Which compound is an alcohol?

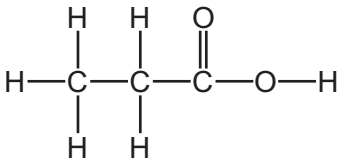
A



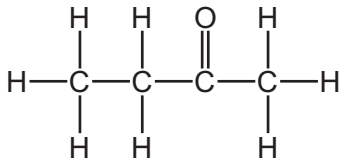
B



C



D



33 An ester has the structural formula $CH_3COOCH_2CH_2CH_3$.

What is the name of this ester?

A ethyl propanoate

B methyl propanoate

C propyl ethanoate

D propyl methanoate

34 Petroleum is separated into fractions in a fractionating column.

Which property of the fractions increases from the bottom to the top of the column?

A boiling point

B chain length

C viscosity

D volatility

35 Three statements about alkanes are listed.

1 They contain carbon and hydrogen only.

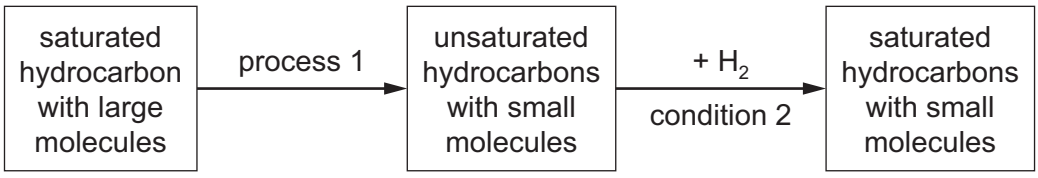
2 They contain only single covalent bonds.

3 They are saturated hydrocarbons.

Which statements are correct?

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

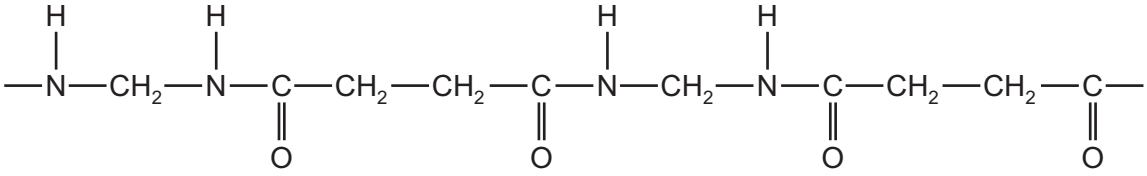
36 The flowchart shows some reactions of hydrocarbons.



Which row is correct?

	process 1	condition 2
A	cracking	heat with nickel catalyst
B	fractional distillation	heat with acid catalyst
C	cracking	heat with acid catalyst
D	fractional distillation	heat with nickel catalyst

37 The structure of a condensation polymer is shown.



Which two monomers form this polymer?

A $H_2NCH_2CH_2NH_2$ and $HOOCCH_2COOH$

B $H_2NCH_2CH_2NH_2$ and $HOOCCH_2CH_2COOH$

C $H_2NCH_2NH_2$ and $HOOCCH_2CH_2COOH$

D $H_2NCH_2NH_2$ and $HOOCCH_2COOH$

38 A titration is completed.

25.0 cm^3 of aqueous sodium hydroxide is added to a conical flask.

A few drops of methyl orange indicator are added.

Dilute hydrochloric acid is added slowly to the mixture until the colour changes.

Which row is correct?

	apparatus used to add alkali	apparatus used to add acid	colour change of indicator
A	volumetric pipette	burette	red to orange
B	measuring cylinder	burette	red to orange
C	volumetric pipette	burette	yellow to orange
D	volumetric pipette	measuring cylinder	yellow to orange

39 An impure sample of compound X has a melting point of 120 °C.

X is purified and its melting point is measured again.

Which row is correct?

	method of purifying X	melting point of pure X / °C
A	crystallisation	125
B	crystallisation	115
C	distillation	125
D	distillation	115

40 Samples of two compounds, P and Q, are tested. The result of each test is shown.

test	P	Q
add dilute hydrochloric acid	gas given off that turns limewater milky	no observable change
acidify with dilute nitric acid then add aqueous barium nitrate	no precipitate forms	white precipitate
add aqueous sodium hydroxide	no observable change	green precipitate, soluble in excess
add aqueous ammonia	no observable change	green precipitate, insoluble in excess
flame test	lilac flame	not tested

Which row shows the identities of the ions present in P and Q?

	P	Q
A	K^+ and SO_4^{2-}	Cr^{3+} and CO_3^{2-}
B	K^+ and CO_3^{2-}	Fe^{2+} and SO_4^{2-}
C	K^+ and CO_3^{2-}	Cr^{3+} and SO_4^{2-}
D	Li^+ and CO_3^{2-}	Cr^{3+} and SO_4^{2-}

BLANK PAGE

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.).