Cambridge Assessment International Education

Cambridge IGCSE™

CHEMISTRY **0620/12**

Paper 1 Multiple Choice (Core) **October/November 2024**

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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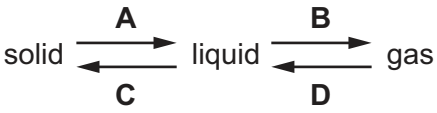
1 The table shows some information about the three states of matter.

	particle separation	particle arrangement	type of motion
1	touching with some particles having spaces between them	random	slide past each other at low speed
2	particles are far apart	random	rapid motion in straight lines
3	touching with very little space between the particles	regular	vibration only

Which row is correct?

	1	2	3
A	gas	liquid	solid
B	liquid	solid	gas
C	liquid	gas	solid
D	solid	gas	liquid

2 Which arrow represents evaporation?



3 In which states of matter does diffusion occur readily?

A gases and liquids

B gases only

C liquids and solids

D solids only

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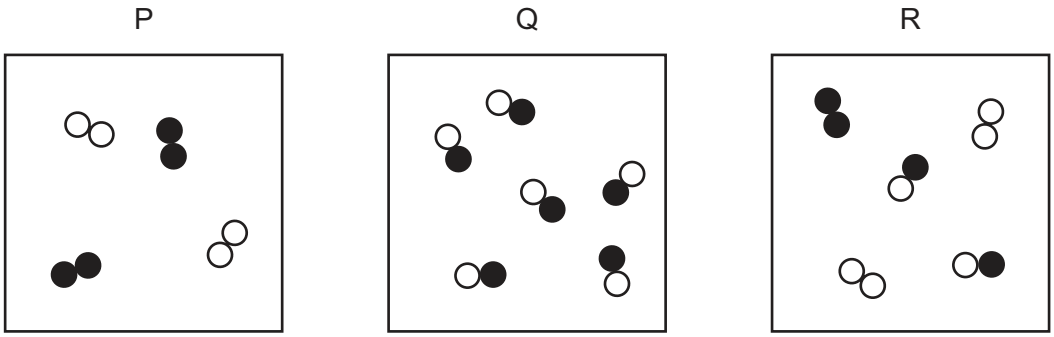
4 Which statement about the boxes P, Q and R is correct?



A Box P contains two compounds, and box R contains two elements.

B Box P contains two elements, and box Q contains a mixture.

C Box P contains two elements, and box Q contains one compound.

D Box Q contains two compounds, and box R contains a mixture.

5 Which information about an element is given by its atomic number?

A the number of protons in the nucleus of an atom of an element

B the number of particles in the nucleus of an atom of an element

C the relative mass of one atom of an element

D the total number of particles in one atom of an element

6 The symbols represent four atoms. The letters used are **not** the usual atomic symbols.

$^{40}_{20}W$ $^{40}_{19}X$ $^{46}_{20}Y$ $^{46}_{22}Z$

Which atoms are isotopes of the same element?

A W and X **B** W and Y **C** X and Y **D** Y and Z

7 Covalent bonds are formed when electrons are .....1..... .

Most covalent compounds have .....2..... electrical conductivity.

Which words correctly complete gaps 1 and 2?

	1	2
A	shared	high
B	shared	low
C	transferred	high
D	transferred	low

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8 Which row describes the structure and a use of diamond?

	structure	use
A	ionic	in cutting tools
B	ionic	as a lubricant
C	giant covalent	in cutting tools
D	giant covalent	as a lubricant

9 Which symbol equation represents the reaction between aqueous sodium hydroxide and dilute sulfuric acid?

A $Na_2OH + H_2SO_4 \rightarrow 2NaSO_4 + H_2O$

B $Na(OH)_2 + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

C $2NaOH + H_2SO_4 \rightarrow 2NaSO_4 + 2H_2O$

D $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

10 What is the relative formula mass of magnesium bromide?

A 47 **B** 82 **C** 104 **D** 184

11 Three substances are listed.

1 solid copper

2 aqueous sodium bromide

3 solid lead(II) bromide

Which substances conduct electricity?

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

12 Hydrogen–oxygen fuel cells can be used to power cars.

Which processes produce the fuel of a hydrogen–oxygen fuel cell?

1 the cracking of hydrocarbons

2 the electrolysis of dilute sulfuric acid

3 photosynthesis

4 the electrolysis of molten aluminium oxide

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

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13 Molten sodium sulfide, Na_2S, is electrolysed using inert electrodes.

Which row identifies the product at each electrode?

	cathode	anode
A	sodium	sulfur
B	sulfur	sodium
C	hydrogen	sulfur
D	sodium	hydrogen

14 The temperature of the water in two beakers, X and Y, is measured as 21.5 °C.

5 g of sodium chloride is dissolved in the water in beaker X. The temperature changes to 18.0 °C.

5 g of calcium oxide is dissolved in the water in beaker Y. The temperature changes to 29.4 °C.

Which types of process are occurring in beakers X and Y?

	X	Y
A	endothermic	endothermic
B	endothermic	exothermic
C	exothermic	endothermic
D	exothermic	exothermic

15 Which process involves a chemical change?

A adding sodium chloride to water

B adding magnesium to hydrochloric acid

C heating solid iodine until it turns into a gas

D melting lead

16 Which two pieces of apparatus are most useful to measure the rate of a reaction in which a gas is given off?

A accurate balance and gas syringe

B accurate balance and thermometer

C gas syringe and stop-watch

D stop-watch and thermometer

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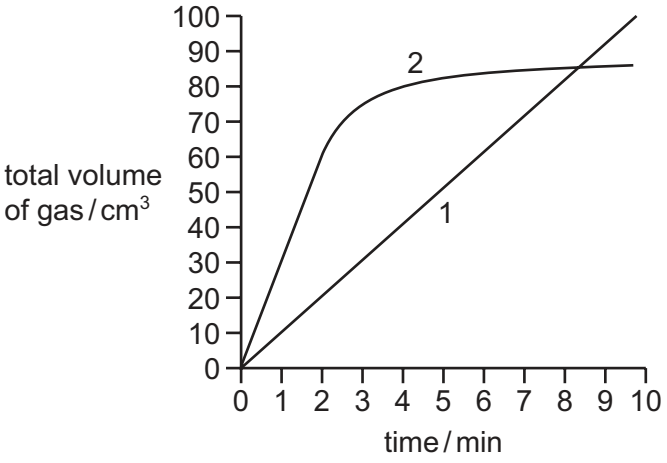
17 Reaction 1 and reaction 2 both produce a gas.

The total volume of gas produced in each reaction is measured every minute for 10 minutes.

A graph of the results is shown.



Which row describes how the rate of reaction changes, if at all, during each reaction?

	reaction 1	reaction 2
A	the rate is constant	the rate decreases after 2 minutes
B	the rate increases	the rate increases
C	the rate increases	the rate decreases after 2 minutes
D	the rate is constant	the rate increases

18 When a few drops of water are added to a solid, E, the colour changes from blue to pink.

What is E?

A anhydrous cobalt(II) chloride

B anhydrous copper(II) sulfate

C hydrated cobalt(II) chloride

D hydrated copper(II) sulfate

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19 The equation for the reaction of magnesium with copper(II) oxide is shown.

$$Mg + CuO \rightarrow MgO + Cu$$

Which word describes this reaction?

A combustion

B decomposition

C neutralisation

D redox

20 Compound M contains calcium.

Two reactions of M are listed.

- M reacts with dilute hydrochloric acid to form a salt and water only.
- M reacts with aqueous ammonium chloride to form a gas that turns damp red litmus paper blue.

What is M?

A CaOH **B** $Ca(OH)_2$ **C** $CaCO_3$ **D** $Ca(CO_3)_2$

21 The diagram shows one period of the Periodic Table.

Li	Be	B	C	N	O	F	Ne

Which two elements form acidic oxides?

A beryllium and lithium

B carbon and neon

C carbon and nitrogen

D nitrogen and neon

22 A student tests four solutions with universal indicator.

Which colour identifies the solution containing the greatest concentration of OH^- ions?

A red

B yellow

C green

D blue

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23 The following steps are done to prepare solid magnesium sulfate.

1 filtration

2 measurement of 20 cm^3 of dilute sulfuric acid using a measuring cylinder

3 evaporation

4 addition of an excess of solid magnesium carbonate to dilute sulfuric acid

What is the correct order for these steps?

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

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

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

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

24 Which statement about the Periodic Table is correct?

A All the metals in the Periodic Table are transition elements.

B The halogens are elements in Group I of the Periodic Table.

C The elements become more metallic across a period from Group I to Group VII.

D The Periodic Table can be used to predict the properties of the elements.

25 Zinc is formed when zinc oxide is heated with carbon.

zinc oxide + carbon $\rightarrow$ zinc + carbon monoxide

Which substance is oxidised in this reaction?

A carbon

B carbon monoxide

C zinc

D zinc oxide

26 Which word equation represents the rusting of iron?

A iron + oxygen + water $\rightarrow$ anhydrous iron(II) hydroxide

B iron + oxygen $\rightarrow$ hydrated iron(II) oxide

C iron + oxygen + water $\rightarrow$ anhydrous iron(III) hydroxide

D iron + oxygen + water $\rightarrow$ hydrated iron(III) oxide

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27 Which option describes the electronic configurations of three different elements from the same group of the Periodic Table?

A 2 2,2 2,8,8,2

B 2 2,8 2,8,2

C 2,1 2,8,1 2,8,8,1

D 2,1 2,2 2,3

28 Which metal forms compounds that can be used to colour glass?

A aluminium

B calcium

C chromium

D sodium

29 Two properties of element R are listed.

- It is a dark solid at room temperature.
- It is a diatomic molecule.

Where on the Periodic Table is R placed?

A Group I

B Group VII

C Group VIII

D transition elements

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30 Four metals, W, X, Y and Z, are tested with either cold water, steam or both.

The observations are shown.

metal	observations
W	reacts slowly with cold water
X	reacts rapidly with cold water
Y	does **not** react with cold water but reacts with steam
Z	does **not** react with cold water or steam

What is the order of reactivity of the metals from the least reactive to the most reactive?

	least reactive →			most reactive
A	W	X	Y	Z
B	W	Y	X	Z
C	Z	Y	X	W
D	Z	Y	W	X

31 Which statement about the displacement reactions of the halogens is correct?

A Iodine displaces bromine from aqueous sodium bromide.

B Bromine displaces chlorine from aqueous potassium chloride.

C Iodine displaces chlorine from aqueous potassium chloride.

D Chlorine displaces bromine from aqueous sodium bromide.

32 Which substances in water from natural sources are beneficial to aquatic animals?

1 metal compounds

2 plastics

3 phosphates

4 dissolved oxygen

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

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33 What are the products formed when glucose is fermented?

A ethanol and carbon dioxide

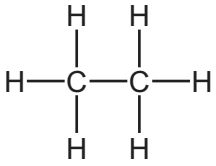
B ethanol and oxygen

C ethene and carbon dioxide

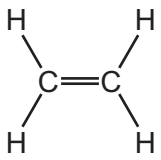
D ethene and oxygen

34 Which structure represents a molecule of ethanol?

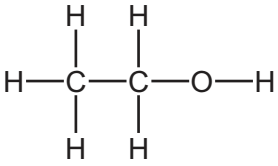
A



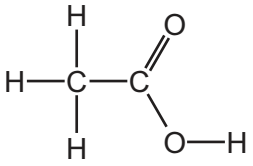
B



C



D



35 Which statement describes a homologous series?

A a family of elements in the same group of the Periodic Table

B a family of elements with similar chemical properties

C a family of compounds with the same functional group

D a family of compounds with similar physical properties

36 What are the properties of aqueous ethanoic acid?

	decolourises aqueous bromine	reacts with calcium carbonate to make carbon dioxide	turns damp red litmus paper blue
A	✓	✓	✗
B	✓	✗	✓
C	✗	✓	✗
D	✗	✗	✓

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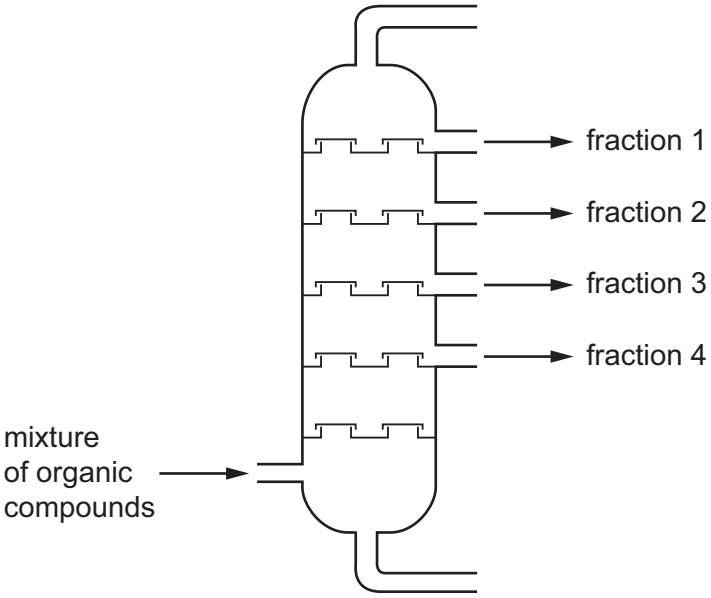
37 Four different organic compounds are separated by a fractionating column.

The table shows the boiling points of the compounds.

The diagram shows the position in the fractionating column where they are separated.

compound	boiling point / °C
Q	69
R	196
S	90
T	125



Which row identifies the compound in each fraction?

	fraction 1	fraction 2	fraction 3	fraction 4
A	Q	S	T	R
B	Q	T	S	R
C	R	T	S	Q
D	R	S	T	Q

38 Which piece of apparatus is used to measure exactly 21.50 cm^3 of dilute sulfuric acid?

A beaker

B burette

C measuring cylinder

D volumetric pipette

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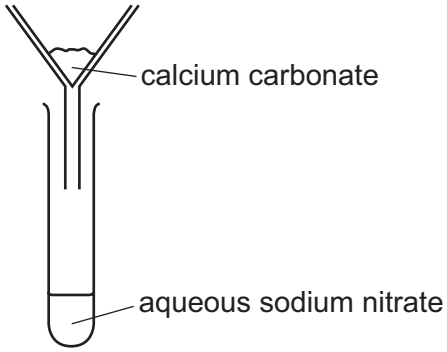
39 Which row shows an advantage and a disadvantage for the stated apparatus used in a titration?

	apparatus	advantage	disadvantage
A	25 cm^3 volumetric pipette	measures volume accurately	can only be used to measure 25 cm^3 of solution
B	50 cm^3 burette	measures volume accurately	can only be used to measure 50 cm^3 of solution
C	100 cm^3 beaker	suitable for filling burette	can only be used to fill a 100 cm^3 burette
D	250 cm^3 conical flask	allows solutions to be mixed without spilling	not suitable for holding volumes less than 250 cm^3

40 Sample M contains calcium carbonate and sodium nitrate.

The result of adding water to M, stirring and filtering is shown.

No chemical reaction occurs.



Which terms describe M, calcium carbonate and aqueous sodium nitrate?

	sample M	calcium carbonate	aqueous sodium nitrate
A	compound	filtrate	residue
B	compound	residue	filtrate
C	mixture	filtrate	residue
D	mixture	residue	filtrate

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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.).