Cambridge Assessment International Education

Cambridge IGCSE™

CHEMISTRY **0620/11**

Paper 1 Multiple Choice (Core) **May/June 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.

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[Turn over

1 The boiling point of sodium is 890 °C.

What happens to sodium atoms as the temperature of a sample of sodium changes from 950 °C to 900 °C?

A The atoms move more quickly and bonds are formed.

B The atoms move more quickly and bonds are neither broken nor formed.

C The atoms move more slowly and bonds are formed.

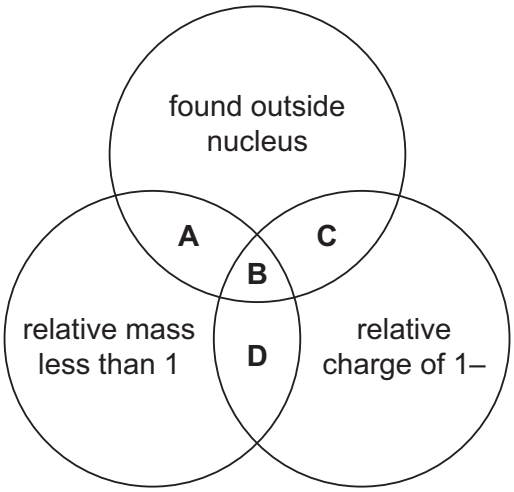
D The atoms move more slowly and bonds are neither broken nor formed.

2 Which row shows the conditions for the particles of a gas colliding most frequently?

	pressure	temperature
A	high	high
B	high	low
C	low	high
D	low	low

3 The diagram shows some properties of particles in an atom.

To which labelled part of the diagram do electrons belong?



4 Some properties of substances W, X, Y and Z are shown.

	melting point / °C	electrical conductivity
W	801	conducts when molten
X	–182	does not conduct
Y	840	conducts when solid
Z	501	conducts when molten

Which substances are ionic?

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

5 Atoms lose or gain electrons to become ions.

Which row is correct?

	change to the atom	type of ion	charge on ion
A	loss of two electrons	cation	2–
B	loss of one electron	anion	1–
C	gain of three electrons	anion	3–
D	gain of one electron	cation	1–

6 A covalent molecule, M, contains four shared pairs of electrons.

What is M?

A ammonia, NH_3

B hydrogen chloride, HCl

C methane, CH_4

D water, H_2O

7 Which substance has a giant covalent structure?

A sodium chloride

B sodium

C ethane

D diamond

8 Iron(III) oxide is reduced by carbon monoxide to produce iron and carbon dioxide.

What is the balanced equation for this reaction?

A $Fe_2O_3 + 2CO \rightarrow 2Fe + 2CO_2$

B $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

C $2Fe_2O_3 + 6CO \rightarrow 2Fe + 6CO_2$

D $2Fe_2O_3 + 3CO \rightarrow 4Fe + 3CO_2$

9 The equation for the reaction between magnesium and dilute hydrochloric acid is shown.

$$Mg + 2HCl \rightarrow MgCl_2 + H_2$$

Which mass of magnesium chloride is formed when 48.0 g of magnesium completely reacts with excess dilute hydrochloric acid?

A 23.8 g **B** 47.5 g **C** 95.0 g **D** 190 g

10 Dilute sulfuric acid and lead(II) bromide are electrolysed separately.

Which statements are correct?

1 Colourless gases are produced when dilute sulfuric acid is electrolysed.

2 Lead(II) bromide can be electrolysed when molten.

3 Lead is formed at the positive electrode when lead(II) bromide is electrolysed.

4 Sulfate ions are produced at the negative electrode when dilute sulfuric acid is electrolysed.

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

11 Which statements about a hydrogen–oxygen fuel cell are correct?

1 The main form of energy released by the fuel cell is heat.

2 The reaction is a redox reaction.

3 An acidic gas is produced.

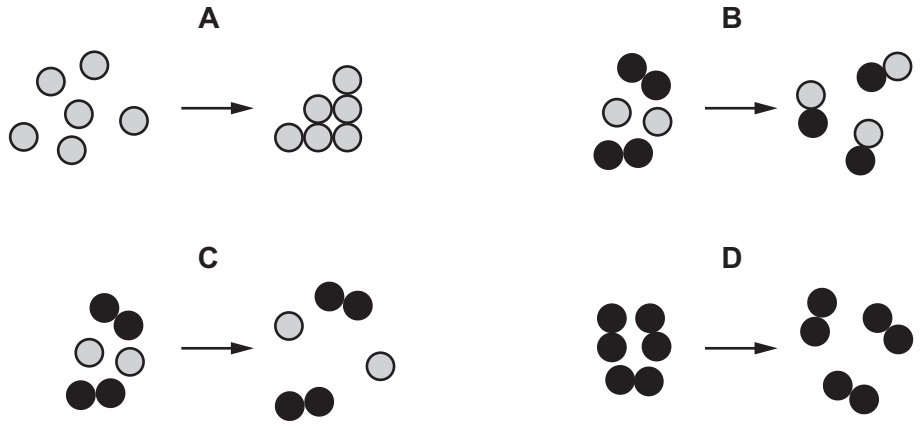
4 Water is the only chemical product.

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

12 Which row describes what happens during an endothermic reaction?

	thermal energy is transferred	change in temperature of the reaction mixture
A	from the surroundings	decrease
B	from the surroundings	increase
C	to the surroundings	decrease
D	to the surroundings	increase

13 Which diagram represents a chemical change?



14 A method used to investigate the rate of reaction of calcium carbonate with dilute hydrochloric acid under different conditions is shown.

- Place 50 cm^3 of dilute hydrochloric acid in a conical flask.
- Add a known volume of water to the conical flask.
- Heat the conical flask to the required temperature.
- Add 1.0 g of calcium carbonate to the conical flask.
- Measure the time taken for the reaction to finish.

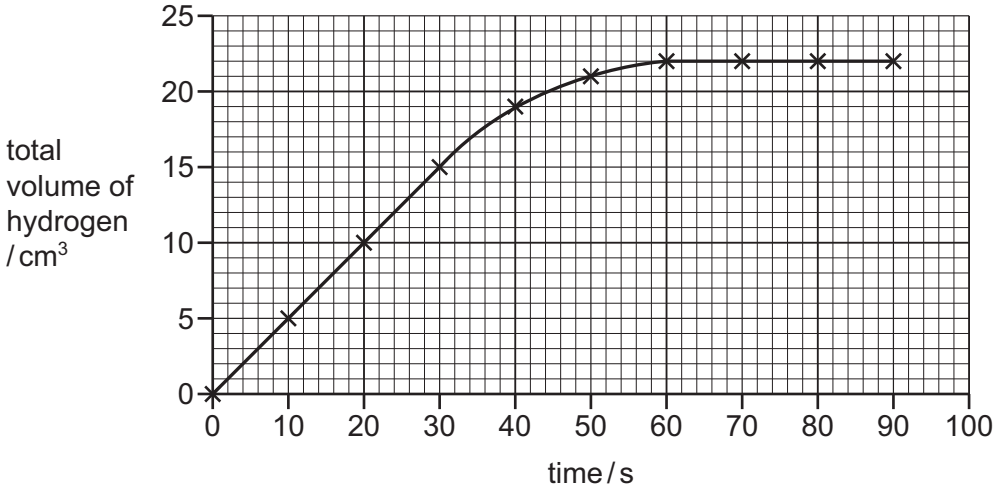
Which volume of water and which temperature give the shortest time taken for the reaction to finish?

	volume of water added / cm^3	temperature / °C
A	10	30
B	10	50
C	40	30
D	40	50

15 The rate of reaction between magnesium and hydrochloric acid is investigated.

The total volume of hydrogen given off is measured at different times.

A graph of the results is shown.



Which conclusions are correct?

1 The rate is fastest between 0 and 30 seconds.

2 The maximum volume of hydrogen given off is 22 cm^3.

3 At 40 seconds, 20 cm^3 of hydrogen is given off.

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

16 Water is added to anhydrous copper(II) sulfate.

Which row describes the direction of energy change and the colour change of the mixture during the reaction?

	direction of energy change	colour change
A	absorbed from the surroundings	blue to white
B	absorbed from the surroundings	white to blue
C	released to the surroundings	blue to white
D	released to the surroundings	white to blue

17 Which equation represents an oxidation reaction?

A $CaCO_3 \rightarrow CaO + CO_2$

B $4FeO + O_2 \rightarrow 2Fe_2O_3$

C $2NO_2 \rightarrow N_2O_4$

D $2P_2O_5 \rightarrow P_4O_{10}$

18 A farmer treats a field with calcium hydroxide to make it less acidic.

When the farmer adds ammonium nitrate fertiliser to the field immediately after the calcium hydroxide, the two substances react.

Why does this reaction make the fertiliser less effective?

A It makes ammonia gas, so less nitrogen is absorbed by the soil.

B It makes an acid, making the soil acidic again.

C It makes nitrogen gas, so less nitrogen is absorbed by the soil.

D It makes the fertiliser too strong, stopping the plants growing well.

19 Which statement about sodium oxide or nitrogen dioxide is correct?

A Nitrogen dioxide is a solid at room temperature.

B Nitrogen dioxide is acidic.

C Sodium oxide has a lower melting point than nitrogen dioxide.

D Sodium oxide is covalently bonded.

20 A titration method is used to prepare a pure soluble sulfate salt from dilute sulfuric acid.

What is the other reagent?

A copper(II) oxide

B magnesium

C sodium hydroxide

D zinc carbonate

21 Which row about elements in the Periodic Table is correct?

	statement 1	statement 2
A	two elements in the same group have similar chemical properties	metals are on the left of the table
B	two elements in the same group have similar chemical properties	metals are on the right of the table
C	two elements in the same period have similar chemical properties	metals are on the left of the table
D	two elements in the same period have similar chemical properties	metals are on the right of the table

22 The table gives some information about three elements in Group I of the Periodic Table.

element	atomic number	melting point in °C	density in g / cm^3
lithium	3	181	0.53
sodium	11	98	0.97
rubidium	37	X	X

Which row identifies the melting point and the density of rubidium?

	melting point in °C	density in g / cm^3
A	39	0.38
B	39	1.53
C	253	0.38
D	253	1.53

23 Which statement describes a transition element?

A It is a dull grey metal that only forms white compounds.

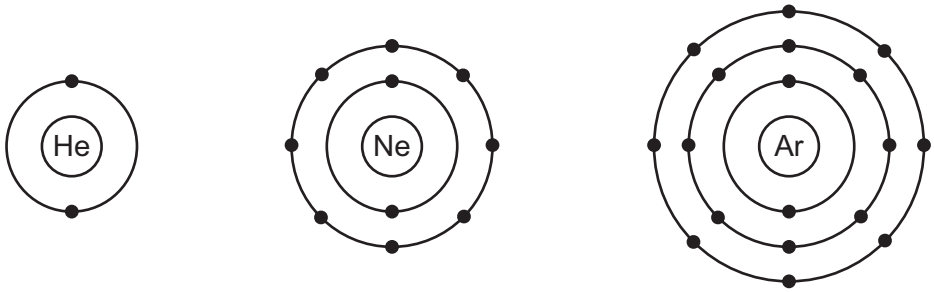
B It is a high-density metal with a high melting point that is used as a catalyst.

C It is a low-density metal with a high melting point that reacts with steam to make hydrogen.

D It is a soft, shiny silver metal that reacts vigorously with water.

[Turn over

24 The electronic configurations of helium, neon and argon are shown.



Which row describes these gases?

	reactivity	form of the gas	electronic configuration
A	reactive	monatomic	incomplete outer shell of electrons
B	unreactive	diatomic	complete outer shell of electrons
C	unreactive	diatomic	incomplete outer shell of electrons
D	unreactive	monatomic	complete outer shell of electrons

25 X is a shiny silver-coloured solid at room temperature and pressure.

X is a good conductor of heat and electricity when solid.

Which statement about X is correct?

A X is an ionic compound or a metallic element.

B X is a metallic element or a non-metallic element.

C X is an alloy or a metallic element.

D X is an alloy or a non-metallic element.

26 Which elements can be combined to produce an alloy?

1 magnesium and aluminium

2 nitrogen and oxygen

3 iron and carbon

4 copper and zinc

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

27 Three metals, L, M and N, are added separately to dilute hydrochloric acid and cold water.

The results are shown.

metal	reaction with dilute hydrochloric acid	reaction with cold water
L	hydrogen forms	no reaction
M	hydrogen forms	hydrogen forms
N	no reaction	no reaction

What is the order of reactivity of the metals?

	least reactive →		most reactive
A	L	N	M
B	M	L	N
C	N	L	M
D	N	M	L

28 Which reaction produces carbon dioxide?

A cracking of large hydrocarbon molecules

B photosynthesis

C reaction of a base with a carbonate

D thermal decomposition of calcium carbonate

[Turn over

29 A sample of air containing four gases only is analysed.

99.0% of the sample contains the two main gases in the same percentages as in clean, dry air.

The remaining 1.0% of the sample contains argon and carbon dioxide.

The gas that makes up 0.1% of the sample turns limewater milky.

Which row shows the percentage composition of the sample of air?

	99.0% of the sample	0.9% of the sample	0.1% of the sample
A	78.0% nitrogen, 21.0% oxygen	argon	carbon dioxide
B	78.0% nitrogen, 21.0% oxygen	carbon dioxide	argon
C	78.0% oxygen, 21.0% nitrogen	argon	carbon dioxide
D	78.0% oxygen, 21.0% nitrogen	carbon dioxide	argon

30 Which substance contains **two** elements that are found in NPK fertilisers?

A ammonium chloride

B calcium hydroxide

C potassium nitrate

D sodium phosphate

31 Which statement about sulfur is correct?

A When sulfur is burned, it produces a substance that causes acid rain.

B Sulfur is produced by the thermal decomposition of limestone.

C Compounds of sulfur make up approximately 1% of unpolluted air.

D Sulfur is a member of the family of elements called halogens.

32 What are **two** adverse effects of particulates in the air?

1 acid rain

2 cancer

3 photochemical smog

4 respiratory problems

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

33 Which formula represents a compound that is a member of the homologous series of alkanes?

A C_2H_4 **B** C_3H_6 **C** C_4H_8 **D** C_5H_{12}

34 Which statement about ethane is correct?

A It rapidly decolourises aqueous bromine.

B It does **not** burn.

C It forms long-chain compounds called polymers.

D It only contains single bonds between its atoms.

35 Which raw material is used to make ethanol by fermentation?

A carbon dioxide

B ethene

C glucose

D natural gas

36 Which statement about ethanoic acid is correct?

A It contains a –COOH group.

B It has a pH greater than pH 7.

C It reacts with sodium carbonate to form hydrogen gas.

D It reacts with copper to form copper(II) ethanoate.

37 Which statement explains why the disposal of plastic waste leads to environmental problems?

A Plastic waste forms toxic gases when it is burned.

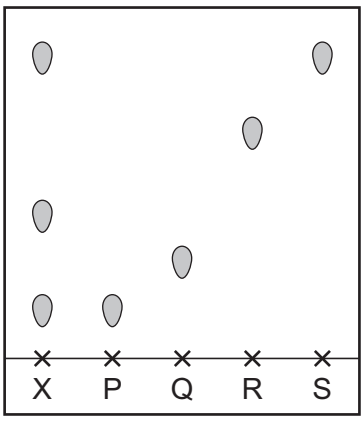
B Plastic waste contains many small molecules.

C Plastic waste rapidly dissolves in the oceans.

D Plastic waste reacts with both acids and bases.

38 Substance X and four known substances, P, Q, R and S, are analysed by chromatography.

The chromatogram produced is shown.



Which statement about X is correct?

A It is a mixture of P, Q and S.

B It contains P and S only.

C It contains P, S and another unknown substance.

D It is a mixture of Q, R and S.

39 Copper is insoluble in water.

Copper(II) oxide is a solid that is insoluble in water but reacts with dilute hydrochloric acid.

Which method is used to separate copper from a mixture of copper and copper(II) oxide?

A dissolve the mixture in water then filter

B dissolve the mixture in water then crystallise

C react the mixture with dilute hydrochloric acid then filter

D react the mixture with dilute hydrochloric acid then crystallise

40 A salt, S, is dissolved in water and three tests are carried out on the solution formed.

	test	result
1	aqueous sodium hydroxide is added	green precipitate forms, insoluble in excess sodium hydroxide
2	dilute nitric acid is added	no reaction
3	aqueous barium nitrate is added to the solution from test 2	white precipitate forms

What is the identity of S?

A copper(II) chloride

B copper(II) sulfate

C iron(II) chloride

D iron(II) sulfate

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.).