Cambridge Assessment International Education

Cambridge IGCSE™

CHEMISTRY **0620/13**

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.

This document has **16** pages. Any blank pages are indicated.

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1 Which two processes are required to change ice into steam?

A boiling and melting

B boiling and freezing

C condensing and melting

D condensing and freezing

2 Which row describes how the volume of a gas changes when the temperature increases, or when the pressure increases?

	temperature increases	pressure increases
A	volume decreases	volume decreases
B	volume decreases	volume increases
C	volume increases	volume decreases
D	volume increases	volume increases

3 Four substances in a mixture are listed.

- calcium nitrate
- iron(II) sulfate
- oxygen
- water

Which statement describes the mixture?

A It contains 6 elements.

B It contains 3 compounds and 1 element.

C It contains 2 compounds and 2 elements.

D It contains 4 compounds.

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4 An ion is represented by the symbol $^{18}_{8}O^{2-}$.

Which statements about this ion are correct?

1 The ion contains 8 electrons.

2 The ion contains 10 neutrons.

3 The ion contains 8 protons.

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

5 What is the meaning of the term nucleon number?

A the number of neutrons in the nucleus of an atom

B the number of protons in the nucleus of an atom

C the total number of protons and electrons in the nucleus of an atom

D the total number of protons and neutrons in the nucleus of an atom

6 Which row describes the electrical conductivity of covalent and ionic compounds when solid and when molten?

	covalent compounds		ionic compounds		
	conductivity when solid	conductivity when molten	conductivity when solid	conductivity when molten	
A	✗	✗	✗	✓	key
B	✗	✓	✗	✓	✓ = good conductivity
C	✓	✓	✗	✗	✗ = poor conductivity
D	✗	✓	✓	✓	

7 Which statement about the bonding in sodium chloride is correct?

A The sodium and chlorine atoms share pairs of electrons.

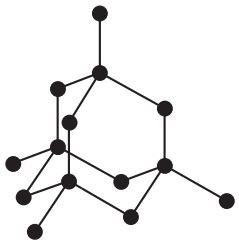
B The chlorine atoms give electrons to the sodium atoms to form positive and negative ions.

C There is covalent bonding between sodium and chlorine.

D The positive and negative ions have noble gas electronic configurations.

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8 The diagram shows the arrangement of carbon atoms in a giant covalent structure.



Which row identifies the substance and describes a use of this substance?

	substance	use of substance
A	diamond	It is an electrode because electrons can move.
B	diamond	It is used as a cutting tool because atoms are strongly bonded together.
C	graphite	It is used as an insulator because electrons cannot move.
D	graphite	It is a lubricant because atoms can slide over each other.

9 Which statement is the correct definition for molecular formula?

A an atom or group of atoms that determine the chemical properties of a compound

B a structure which shows all the atoms and all the bonds in a compound

C the number and arrangement of different atoms in one gram of a compound

D the number and type of different atoms in one molecule of a compound

10 A compound, T, has the formula CH_3Cl.

Three statements about this compound are listed.

1 A molecule of the compound contains five atoms.

2 A molecule of the compound contains five different elements.

3 The relative molecular mass of the compound is 50.5.

Which statements are correct?

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

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11 Iron water taps are often electroplated with a layer of chromium.

Which statements explain why iron water taps are electroplated?

1 It improves the appearance of the taps.
2 It increases the strength of the taps.
3 It prevents the corrosion of the taps.
4 It improves the electrical conductivity of the taps.

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

12 Molten caesium bromide is electrolysed using inert electrodes.

Which row identifies the product at each electrode?

	anode	cathode
A	bromine	caesium
B	caesium	bromine
C	hydrogen	oxygen
D	oxygen	hydrogen

13 Which equation represents the overall reaction in a hydrogen–oxygen fuel cell?

A $4H + O_2 \rightarrow 2H_2O$

B $2H_2 + O_2 \rightarrow 2H_2O$

C $H_2 + O_2 \rightarrow H_2O$

D $2H + O \rightarrow H_2O$

14 Which statements about endothermic reactions are correct?

1 The energy of the products is greater than the energy of the reactants.
2 The energy of the reactants is greater than the energy of the products.
3 The temperature of the surroundings increases during the reaction.
4 The temperature of the surroundings decreases during the reaction.

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

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15 Which process is a physical change?

A firework exploding

B burning wood

C chocolate melting

D iron rusting

16 Magnesium reacts with dilute hydrochloric acid, HC*l*, to produce hydrogen gas.

Which row identifies the reaction conditions that give the fastest rate of reaction?

	temperature in °C	HC*l* concentration in mol / dm^3	magnesium solid
A	30	1.0	powder
B	40	2.0	powder
C	30	1.0	ribbon
D	40	2.0	ribbon

17 Which reaction produces a white-coloured substance?

A adding water to anhydrous cobalt(II) chloride

B adding water to anhydrous copper(II) sulfate

C heating hydrated cobalt(II) chloride

D heating hydrated copper(II) sulfate

18 In a blast furnace, iron is extracted when iron(III) oxide reacts with carbon monoxide.

The equation is shown.

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

Which substance is oxidised and which is reduced in this reaction?

	oxidised	reduced
A	CO	Fe_2O_3
B	CO_2	Fe
C	Fe	CO_2
D	Fe_2O_3	CO

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19 Which row shows the colours of litmus and methyl orange with solutions of acids or bases?

	solution	litmus	methyl orange
A	acid	red	red
B	acid	blue	yellow
C	base	blue	red
D	base	red	yellow

20 Aqueous sodium hydroxide is reacted with excess dilute hydrochloric acid.

Which ion causes the resulting mixture to be acidic?

A Na^+ **B** H^+ **C** OH^- **D** Cl^-

21 Universal indicator is added to an aqueous solution of oxide X.

The indicator changes colour from green to red.

What is X?

A MgO **B** CaO **C** K_2O **D** NO_2

22 Which rows identify two aqueous salts which react together to produce a precipitate?

	salt 1	salt 2
1	sodium sulfate	barium nitrate
2	sodium chloride	barium sulfate
3	barium chloride	lead(II) nitrate
4	lead(II) chloride	barium nitrate

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

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23 Which statements about elements in the Periodic Table are correct?

1 Elements in the same group have the same number of electrons in their outer shell.

2 Elements in the same period have the same number of occupied electron shells.

3 The elements are arranged in order of their atomic mass.

4 Every period contains eight elements.

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

24 Four mixtures each contain a halogen and an aqueous sodium halide.

Which row describes what happens in the mixtures shown?

	mixture	description
A	iodine + sodium bromide	A displacement reaction occurs because iodine is more reactive than bromine.
B	bromine + sodium chloride	A displacement reaction occurs because chlorine is more reactive than bromine.
C	chlorine + sodium bromide	A displacement reaction occurs because chlorine is more reactive than bromine.
D	bromine + sodium iodide	A displacement reaction occurs because iodine is more reactive than bromine.

25 Which row describes a transition element?

	density in g/cm^3	colour of chloride
A	0.98	green
B	0.98	white
C	8.90	green
D	8.90	white

26 Which statement about the use of metals is correct?

A Aluminium has a high strength and high density so is used to make aircraft.

B Copper has a low melting point so is used in electrical wiring.

C Aluminium is resistant to corrosion so is used in food containers.

D Zinc is used to make the alloy stainless steel which is used in cutlery.

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27 Which statements explain why stainless steel is used in cutlery?

1 It is resistant to rusting.

2 It is a hard material.

3 It is a pure metal.

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

28 Four different metals are separately mixed with an equal volume of dilute hydrochloric acid.

The table shows the rate of effervescence for each metal.

metal	rate of effervescence
calcium	very high
copper	none
iron	low
magnesium	high

What is the order of reactivity of the four metals starting with the **most** reactive?

A iron → magnesium → calcium → copper

B magnesium → calcium → copper → iron

C copper → iron → magnesium → calcium

D calcium → magnesium → iron → copper

29 Which statement about the rusting of iron is correct?

A The rusting of iron forms hydrated iron(II) oxide.

B Barrier methods prevent rusting by excluding nitrogen and water.

C A piece of iron submerged in water will **not** rust.

D Coating with plastic is a barrier method that prevents iron rusting.

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30 Water is extracted from a river for use in a domestic water supply.

Some treatments for domestic water are listed.

- chlorination
- sedimentation and filtration
- treatment with carbon

Which statement about these treatments is correct?

A Filtration is used to remove soluble substances.

B Treatment with carbon is used to remove unpleasant odours.

C Chlorination is used to remove unpleasant tastes.

D Sedimentation is used to kill microbes.

31 A farmer knows his soil needs phosphorus and potassium.

He has a choice of four fertilisers.

1 NH_4NO_3

2 $(NH_4)_3PO_4$

3 KNO_3

4 $(NH_2)_2CO$

Which fertilisers should he use?

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

32 Which strategies are useful in reducing the production of acid rain?

1 planting trees

2 using catalytic converters in motor vehicles

3 reducing livestock farming

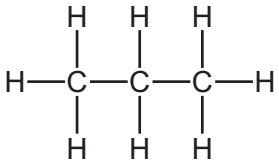
4 using low-sulfur fuels

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

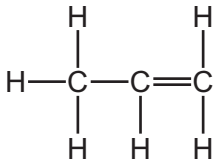
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33 The structures of four organic compounds, W, X, Y and Z, are shown.

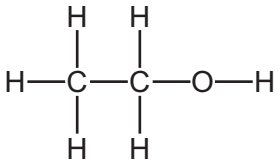
W



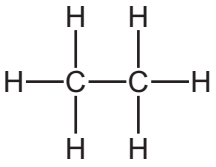
X



Y



Z



Which compounds are members of the same homologous series?

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

34 Which molecular formula represents an alkene?

A C_2H_6O **B** C_2H_6 **C** CH_4 **D** C_3H_6

35 Which row identifies the petroleum fractions used to reduce the friction between metal parts in engines and as a fuel in cars?

	fraction used to reduce friction in engines	fraction used as a fuel in cars
A	gas oil	gasoline
B	gas oil	fuel oil
C	lubricating oil	fuel oil
D	lubricating oil	gasoline

36 Four fuels are listed.

1 ethanol
2 coal
3 hydrogen
4 natural gas

Which fuels are fossil fuels?

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

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37 Aqueous bromine is added to two test-tubes.

Excess hexene is added to one test-tube.

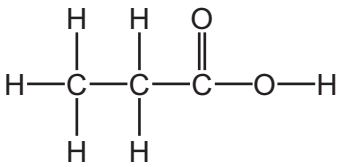
Excess hexane is added to the second test-tube.

Which row describes the observation in each test-tube?

	hexene	hexane
A	orange to colourless	orange to colourless
B	orange to colourless	remains orange
C	colourless to orange	remains colourless
D	remains orange	orange to colourless

38 The structure of a compound, G, is shown.

G is in the same homologous series as ethanoic acid.



Which row describes an aqueous solution of G?

	produces a gas with magnesium	turns methyl orange yellow
A	no	yes
B	no	no
C	yes	no
D	yes	yes

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39 When zinc reacts with dilute sulfuric acid, hydrogen gas is produced.

Which apparatus is needed to investigate the effect of temperature on the rate of this reaction?

1 thermometer

2 stop-watch

3 volumetric pipette

4 gas syringe

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

40 Two tests are carried out on substance Z.

test 1 A flame test produces a red flame.

test 2 Z is dissolved in water and dilute nitric acid is added, followed by aqueous silver nitrate. A yellow precipitate is produced.

What is substance Z?

A lithium bromide

B lithium iodide

C sodium bromide

D sodium iodide

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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.).