Cambridge Assessment International Education

Cambridge IGCSE™

CHEMISTRY **0620/12**

Paper 1 Multiple Choice (Core) **October/November 2023**

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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1 The melting points and boiling points of four elements are shown.

element	melting point / °C	boiling point / °C
W	–7	60
X	–101	–34
Y	114	184
Z	39	688

In which elements do the particles vibrate about fixed positions at 0 °C?

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

2 Which statements about clean, dry air are correct?

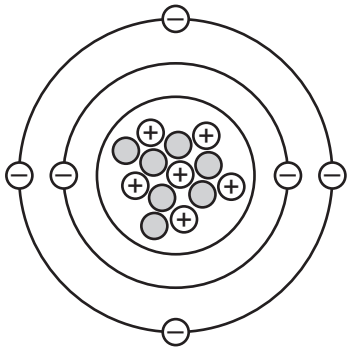
1 It is a mixture of elements only.

2 It is a mixture of elements and compounds.

3 It contains only non-metals.

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

3 A representation of an atom is shown.



What is the nucleon number of this atom?

A 6 **B** 7 **C** 12 **D** 13

4 Which statement describes isotopes of the same element?

A They have different electron arrangements.

B They have different nuclear charges.

C They have nuclei with masses that are the same.

D They have the same number of protons.

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5 Potassium reacts with iodine to form potassium iodide.

Which statement about potassium iodide is correct?

A Each potassium atom shares a pair of electrons with an iodine atom.

B In potassium iodide, the particles of potassium have more protons than electrons.

C Potassium iodide has a high melting point because it is a covalent compound.

D Potassium iodide has a low melting point because it is an ionic compound.

6 Which row describes the properties of a simple molecular substance?

	boiling point	electrical conductivity when solid
A	low	poor
B	high	poor
C	low	good
D	high	good

7 Different forms of an element G are used as lubricants and in cutting tools.

What is the structure of G?

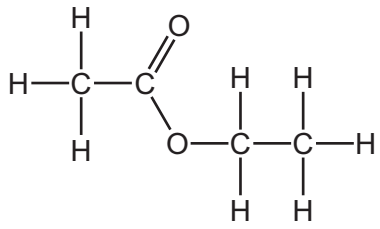
A giant covalent

B ionic

C metallic

D simple covalent

8 The diagram shows the structure of a molecule of ethyl ethanoate.



What is the molecular formula of a molecule of ethyl ethanoate?

A CHO **B** $C_4H_8O_2$ **C** $C_4(H_2)_2(O_2)$ **D** C_2H_4O

9 The formula of a compound containing element X is $Na_2X_2O_3$.

The relative formula mass of the compound is 158.

What is the relative atomic mass of X?

A 32 **B** 59.5 **C** 64 **D** 119

10 Limestone is used to reduce sulfur dioxide emissions from coal-fired power stations.

The equation for the reaction is shown.

$$CaCO_3 + SO_2 \rightarrow CaSO_3 + CO_2$$

What is the smallest mass of $CaCO_3$ required to remove 1 tonne of SO_2?

A 1 tonne

B 2 tonnes

C 64 tonnes

D 100 tonnes

11 Which statement about electrolysis is correct?

A Bromine and hydrogen are formed during the electrolysis of molten lead(II) bromide.

B Metals are formed at the positive electrode.

C Molten covalent compounds are broken down by electricity.

D Platinum is used as an inert electrode.

12 Which statements about hydrogen-oxygen fuel cells are correct?

1 The reaction between hydrogen and oxygen is endothermic.

2 The waste product in a hydrogen-oxygen fuel cell is water.

3 A chemical reaction in the cell produces hydrogen which is used as the fuel.

4 A hydrogen-oxygen fuel cell is used to generate electricity.

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

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13 The initial and final temperatures of four different reactions are measured.

Which reaction is the **least** exothermic?

	initial temperature / °C	final temperature / °C
A	19	25
B	21	18
C	22	17
D	22	26

14 Solid calcium carbonate reacts with dilute hydrochloric acid.

Which changes to the reaction conditions increase the rate of reaction?

	concentration of hydrochloric acid	surface area of calcium carbonate
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

15 Zinc reacts slowly with dilute sulfuric acid at room temperature.

Bubbles of a gas, L, form on the surface of the zinc.

When a small amount of copper is added, the reaction is faster.

Which row identifies L and explains why the reaction is faster?

	gas formed in reaction	reason the reaction is faster
A	hydrogen	copper acts as a catalyst
B	hydrogen	copper is more reactive than zinc
C	oxygen	copper acts as a catalyst
D	oxygen	copper is more reactive than zinc

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16 Which reaction shows a colour change from white to blue?

A adding water to anhydrous copper(II) sulfate

B adding water to hydrated copper(II) sulfate

C heating anhydrous copper(II) sulfate

D heating hydrated copper(II) sulfate

17 In a blast furnace, iron(III) oxide is converted to iron and carbon monoxide is converted to carbon dioxide.

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

What happens to each of these reactants?

A Both iron(III) oxide and carbon monoxide are oxidised.

B Both iron(III) oxide and carbon monoxide are reduced.

C Iron(III) oxide is oxidised and carbon monoxide is reduced.

D Iron(III) oxide is reduced and carbon monoxide is oxidised.

18 Which products are formed when magnesium carbonate reacts with dilute hydrochloric acid?

A carbon dioxide, hydrogen and magnesium chloride

B carbon dioxide and magnesium chloride only

C carbon dioxide, water and magnesium chloride

D water and magnesium chloride only

19 Which element forms an oxide that reacts with an aqueous solution of a base?

A argon

B sulfur

C magnesium

D copper

20 Which salt is insoluble?

A barium sulfate

B lead(II) nitrate

C magnesium chloride

D sodium carbonate

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21 Some properties of element R are shown.

melting point in °C	98
boiling point in °C	883
reaction with cold water	gives off H_2 gas
reaction when heated with oxygen	burns to give a white solid

In which part of the Periodic Table is R found?

A Group I

B Group VII

C Group VIII

D transition elements

22 Lithium, sodium and potassium are elements in Group I.

Statements about these elements are listed.

1 Lithium is more dense than sodium.

2 Sodium is more reactive than potassium.

3 They all conduct electricity at room temperature.

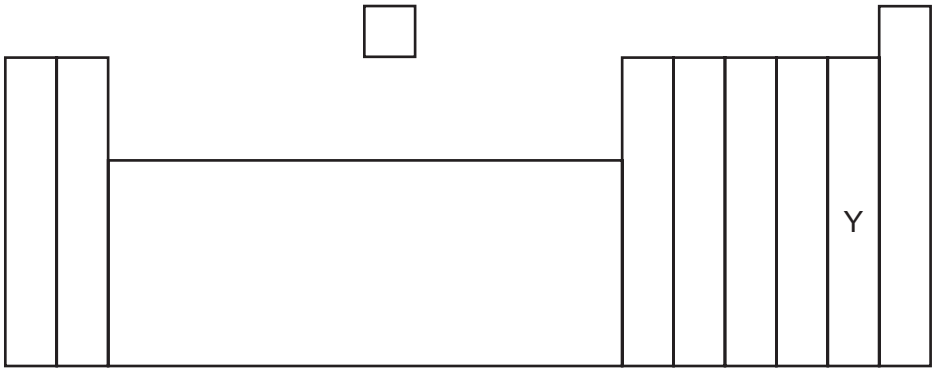
4 They all react with oxygen at room temperature.

Which statements are correct?

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

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23 An outline of the Periodic Table is shown.



Which name is given to the elements in column Y?

A alkali metals

B halogens

C noble gases

D transition elements

24 Which row describes the properties of a metal that can be used in the manufacture of aircraft?

	strength	density	ease of corrosion
A	high	high	corrodes easily
B	high	low	resists corrosion
C	low	high	corrodes easily
D	low	low	resists corrosion

25 Which metallic element is added to iron in the manufacture of stainless steel?

A carbon

B copper

C lead

D nickel

26 Which statement about the uses of metals is correct?

A Aluminium is used in the manufacture of overhead electrical cables as it has a high density.

B Aluminium is used to make food containers as it conducts electricity.

C Stainless steel is used in cutlery because it is resistant to rusting.

D Stainless steel is used to make chemical reactors because it is a soft alloy.

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27 The list gives the order of some metals and hydrogen in the reactivity series.

Metal X is also included.

most reactive	K
	Mg
	Zn
	H
	X
least reactive	Cu

Which row shows the properties of metal X?

	reacts with dilute acids	oxide reduced by carbon
A	no	no
B	no	yes
C	yes	no
D	yes	yes

28 Which gas in the air is needed for iron to rust?

A argon

B carbon dioxide

C nitrogen

D oxygen

29 Why is limestone added to the blast furnace?

A It neutralises the molten slag produced.

B It reacts with impurities to form slag.

C It releases carbon dioxide which reduces the iron(III) oxide.

D It removes acidic gases such as carbon dioxide.

30 Which process removes carbon dioxide from the atmosphere?

A photosynthesis

B thermal decomposition of calcium carbonate

C combustion of fossil fuels

D reaction of sodium carbonate with an acid

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31 The flow chart shows stages in the treatment of river water to produce drinking water.



What occurs at stages J and K?

	J	K
A	distillation	chlorination
B	distillation	filtration
C	filtration	chlorination
D	filtration	distillation

32 Which two compounds can be mixed together to form an NPK fertiliser?

A ammonium phosphate and calcium hydroxide

B calcium phosphate and ammonium nitrate

C potassium nitrate and calcium oxide

D potassium phosphate and ammonium nitrate

33 What are the main substances produced by the fractional distillation of liquid air?

A oxygen and carbon dioxide

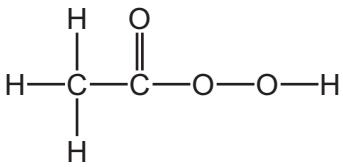
B oxygen and nitrogen

C helium and nitrogen

D hydrogen and oxygen

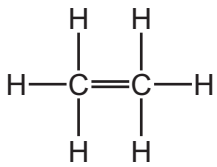
34 Which diagram shows the displayed formula for the named organic compound?

A



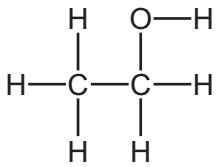
ethanoic acid

B



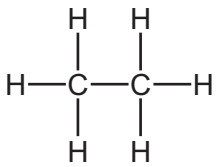
ethene

C



ethanol

D



methane

35 Poly(ethene) is formed from petroleum using three separate processes.

In which order are the processes used?

A cracking → fractional distillation → polymerisation

B cracking → polymerisation → fractional distillation

C fractional distillation → cracking → polymerisation

D fractional distillation → polymerisation → cracking

36 Gas oil and naphtha are two fractions obtained from petroleum.

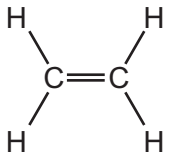
What are uses of gas oil and naphtha?

	gas oil	naphtha
A	jet fuel	making chemicals
B	jet fuel	making roads
C	diesel engine fuel	making chemicals
D	diesel engine fuel	making roads

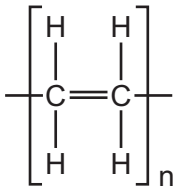
37 Ethene can be polymerised.

Which diagram represents the structure of the product formed?

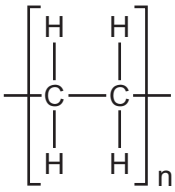
A



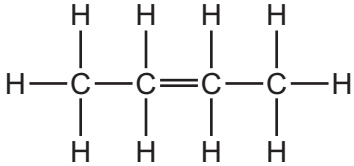
B



C



D



38 An acid–base titration is described.

- 25.0 cm^3 of dilute aqueous alkali is put into a conical flask.
- Indicator is added to the flask.
- Dilute acid is added to the aqueous alkali until the indicator changes colour.
- The volume of acid used is then recorded.

Which use of apparatus is correct?

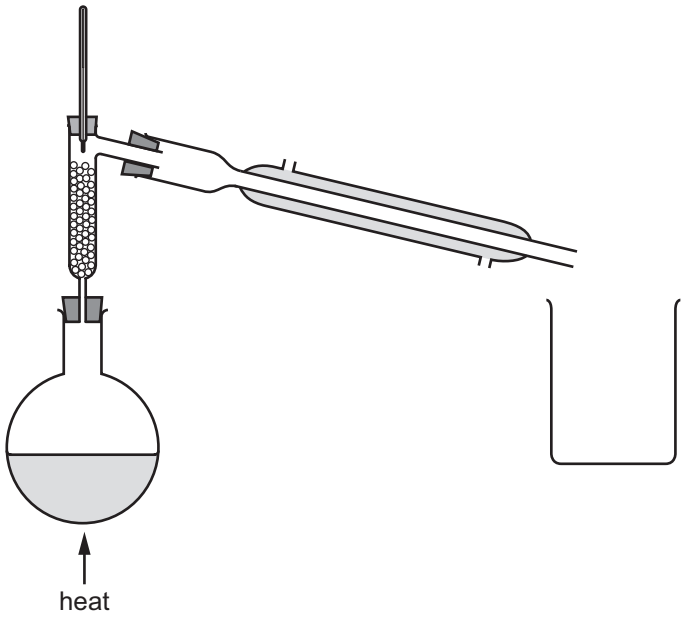
A The 25.0 cm^3 of aqueous alkali is measured using a volumetric pipette.

B The 25.0 cm^3 of aqueous alkali is measured using the lines on the conical flask.

C The volume of acid is measured using a measuring cylinder.

D The volume of acid is measured using a volumetric pipette.

39 The apparatus shown is used to separate a mixture.



What is the mixture?

A anhydrous copper(II) sulfate and hydrated copper(II) sulfate

B sodium chloride and sand

C ethanol and methanol

D iron and steel

40 The results of tests on three gases, X, Y and Z, are shown.

test	X	Y	Z
aqueous potassium manganate(VII)	purple to colourless	no change	no change
damp red litmus paper	no change	turns blue	no change
lighted splint	no change	no change	pops

What are X, Y and Z?

	X	Y	Z
A	chlorine	sulfur dioxide	hydrogen
B	chlorine	sulfur dioxide	oxygen
C	sulfur dioxide	ammonia	oxygen
D	sulfur dioxide	ammonia	hydrogen

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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.).