Cambridge Assessment International Education

Cambridge IGCSE™

CHEMISTRY **0620/12**

Paper 1 Multiple Choice (Core) **May/June 2022**

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.

[Turn over

1 Substances change state when their temperature is changed.

Which changes of state take place when the temperature of a substance is lowered?

1 boiling

2 condensation

3 freezing

4 melting

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

2 A student measures the time taken for 2.0 g of magnesium to dissolve in 50 cm^3 of dilute sulfuric acid.

Which apparatus is essential to complete the experiment?

1 stop-clock

2 measuring cylinder

3 thermometer

4 balance

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

3 Which method is used to separate a mixture of the following liquids?

liquid	boiling point / °C
methanol	64.5
ethanol	78.5
propan-1-ol	97.2
butan-1-ol	117.0

A crystallisation

B evaporation

C filtration

D fractional distillation

4 X and Y are two different elements.

X and Y have the same number of nucleons.

Which statement about X and Y is correct?

A They have the same physical properties.

B Their atoms have the same number of electrons.

C They are in different groups of the Periodic Table.

D They have different relative masses.

5 Which row identifies an alloy, a pure metal and a non-metal?

	alloy	pure metal	non-metal
A	brass	carbon	copper
B	brass	copper	carbon
C	copper	brass	carbon
D	copper	carbon	brass

6 Which statement about ions and ionic bonding is correct?

A Caesium atoms gain electrons to form negatively charged caesium ions.

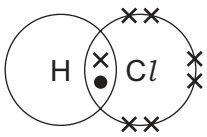
B Ionic bonding involves sharing of pairs of electrons.

C Potassium ions and chloride ions have the same number of outer-shell electrons.

D Sodium ions have an equal number of protons and electrons.

7 Which dot-and-cross diagram shows the arrangement of outer shell electrons in a molecule of hydrogen chloride?

A



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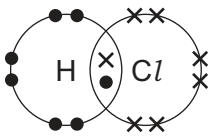

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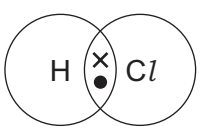

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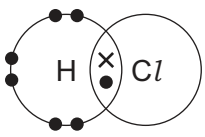


8 Which statement explains why graphite can be used as a lubricant?

A All of the atoms in graphite are carbon.

B Each carbon atom forms three bonds.

C Graphite has a macromolecular structure.

D The layers in graphite can slide over each other.

9 A compound of element X has the formula X_2O and a relative formula mass of 144.

What is element X?

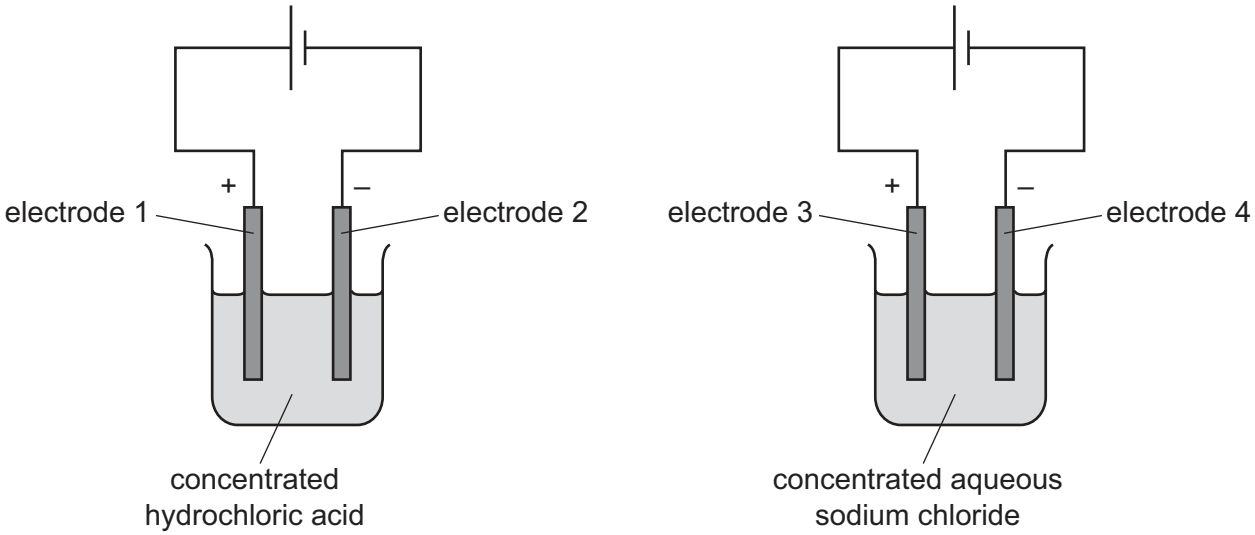
A copper, Cu

B gadolinium, Gd

C sulfur, S

D tellurium, Te

10 The diagram shows the electrolysis of concentrated hydrochloric acid and concentrated aqueous sodium chloride using carbon electrodes.



At which electrodes is hydrogen produced?

A electrode 1 only

B electrodes 1 and 3

C electrode 2 only

D electrodes 2 and 4

11 Which type of reaction occurs when calcium carbonate is heated at a high temperature to produce calcium oxide and carbon dioxide?

A combustion

B endothermic

C oxidation

D reduction

12 Which row identifies a chemical change and a physical change?

	chemical change	physical change
A	boiling ethanol	burning ethanol
B	burning ethanol	evaporating ethanol
C	dissolving ethanol in water	burning ethanol
D	evaporating ethanol	dissolving ethanol in water

13 Which statement about rate of reaction is correct?

A Catalysts increase the time for the reaction to be completed.

B Decreasing particle size increases the rate of reaction.

C Decreasing temperature increases the rate of reaction.

D Rate of reaction decreases as the concentration increases.

14 Some common household substances are tested with litmus and methyl orange.

household substance	colour of litmus	colour of methyl orange
bicarbonate of soda	blue	yellow
lemonade	red	red
milk	red	red
milk of magnesia	blue	yellow
washing powder	blue	yellow
vinegar	red	red

Which statement is correct?

A Lemonade, milk and bicarbonate of soda are all acidic.

B Milk of magnesia can neutralise washing powder.

C Milk of magnesia, washing powder and vinegar are all bases.

D Vinegar can neutralise bicarbonate of soda.

[Turn over

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

What happens during the reaction?

A The copper(II) sulfate turns blue and the solution formed gets colder.

B The copper(II) sulfate turns blue and the solution formed gets hotter.

C The copper(II) sulfate turns white and the solution formed gets colder.

D The copper(II) sulfate turns white and the solution formed gets hotter.

16 In which equation is carbon both oxidised and reduced?

A $C + O_2 \rightarrow CO_2$

B $CO_2 + C \rightarrow 2CO$

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

D $2CO + O_2 \rightarrow 2CO_2$

17 Aqueous solutions containing copper(II) ions can be identified using flame tests and by adding aqueous sodium hydroxide.

Which row describes what is observed in these tests?

	flame test	aqueous sodium hydroxide
A	blue-green flame	light blue precipitate
B	blue-green flame	green precipitate
C	lilac flame	light blue precipitate
D	lilac flame	green precipitate

18 The oxides of two elements, X and Y, are separately dissolved in water and the pH of each solution tested.

oxide tested	pH of solution
X	1
Y	13

Which information about X and Y is correct?

	oxide is acidic	oxide is basic	metal	non-metal
A	X	Y	X	Y
B	X	Y	Y	X
C	Y	X	X	Y
D	Y	X	Y	X

19 An acid is neutralised by adding an excess of an insoluble solid base.

A soluble salt is formed.

How is the pure salt obtained from the reaction mixture?

A crystallisation → evaporation → filtration

B evaporation → crystallisation → filtration

C filtration → crystallisation → evaporation

D filtration → evaporation → crystallisation

20 Some statements about gas G are listed.

G is monoatomic.

G is found in clean, dry air.

G is used in lamps.

Which element is G?

A argon

B helium

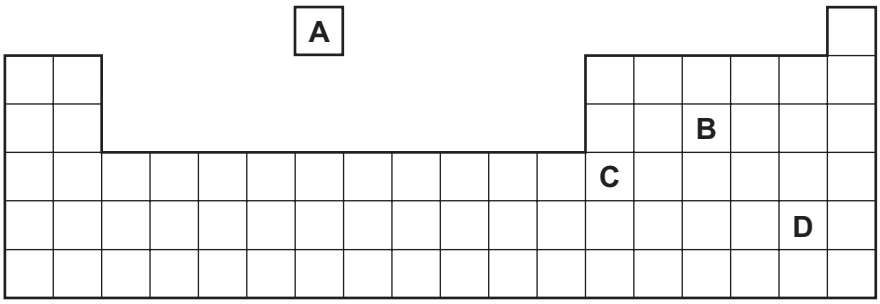
C nitrogen

D oxygen

[Turn over

21 Part of the Periodic Table is shown.

Which element is a metal?



22 The elements sodium to argon form Period 3 of the Periodic Table.

Which row describes the trend across Period 3 from left to right?

	number of outer-shell electrons	metallic character	group number
A	decreases	decreases	decreases
B	decreases	increases	decreases
C	increases	decreases	increases
D	increases	increases	increases

23 Some properties of element E are listed.

It has a high density.

It has a high melting point.

What is E?

A aluminium

B bromine

C iron

D lithium

24 Lithium, sodium and potassium are elements in Group I of the Periodic Table.

Chlorine, bromine and iodine are elements in Group VII of the Periodic Table.

Which row identifies the **least** dense of these elements in each group?

	Group I	Group VII
A	lithium	chlorine
B	lithium	iodine
C	potassium	chlorine
D	potassium	iodine

25 The reactions of metals P, Q, R and S are shown.

metal	reaction with water	reaction with hydrochloric acid	reduction of the metal oxide with carbon
P	no reaction	no reaction	reduced
Q	slow	vigorous	no reaction
R	vigorous	vigorous	no reaction
S	very slow	vigorous	reduced

What is the order of reactivity of the metals?

	least reactive			most reactive
A	P	S	Q	R
B	P	Q	S	R
C	R	S	Q	P
D	R	Q	S	P

26 Iron is extracted from hematite in the blast furnace at a temperature of about 1550 °C.

Which equation shows the main reaction that increases the temperature in the furnace?

A $CaCO_3 \rightarrow CaO + CO_2$

B $C + O_2 \rightarrow CO_2$

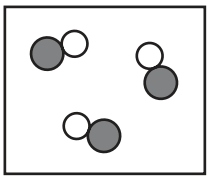
C $CO_2 + C \rightarrow 2CO$

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

[Turn over

27 Which diagram represents the arrangement of atoms in an alloy?

A



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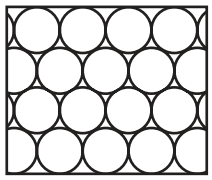

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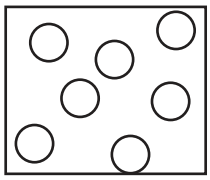

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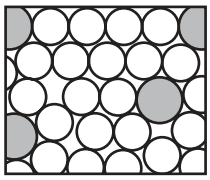


28 Which uses of the metals shown are correct?

	aluminium	stainless steel
A	aircraft bodies	car bodies
B	car bodies	aircraft bodies
C	chemical plant	food containers
D	food containers	cutlery

29 Which row identifies a substance present in clean air and a substance that is a pollutant in air?

	present in clean air	pollutant in air
A	oxides of nitrogen	nitrogen
B	carbon dioxide	sulfur dioxide
C	carbon monoxide	lead compounds
D	nitrogen	argon

30 Which property of sulfur dioxide explains why it is used as a food preservative?

A acidic oxide

B bleach

C kills bacteria

D pungent smell

31 Fertilisers are used to provide three of the elements needed for plant growth.

Which two compounds would give a fertiliser containing all three of these elements?

A $Ca(NO_3)_2$ and $(NH_4)_2SO_4$

B $Ca(NO_3)_2$ and $(NH_4)_3PO_4$

C KNO_3 and $(NH_4)_2SO_4$

D KNO_3 and $(NH_4)_3PO_4$

32 Compound J is an unsaturated carboxylic acid.

Which bonds are present in a molecule of J?

	C=C	C=O	O–H
A	✓	✓	✓
B	✗	✓	✓
C	✓	✗	✗
D	✗	✓	✗

key

✓ = yes

✗ = no

33 Petroleum is separated into useful fractions by fractional distillation.

Which fraction is used as a fuel for jet aeroplanes?

A fuel oil

B gasoline

C naphtha

D kerosene / paraffin

34 What are the products when limestone (calcium carbonate) is heated strongly?

A calcium hydroxide and carbon dioxide

B calcium hydroxide and carbon monoxide

C calcium oxide and carbon dioxide

D calcium oxide and carbon monoxide

35 Ethene reacts with substance X to form ethanol.

What is X?

A ethanoic acid

B glucose

C hydrogen

D steam

36 What is the equation for the complete combustion of methane?

A $CH_4 + 4O_2 \rightarrow CO_2 + 2H_2O$

B $2CH_4 + 3O_2 \rightarrow 2CO + 4H_2O$

C $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

D $C_2H_6 + 3O_2 \rightarrow 2CO_2 + 3H_2O$

37 Alkenes can be produced by cracking large hydrocarbon molecules to form smaller hydrocarbon molecules.

Which equations represent possible reactions when tetradecane, $C_{14}H_{30}$, is cracked?

1 $C_{14}H_{30} \rightarrow C_2H_6 + C_3H_6 + C_4H_8 + C_5H_{10}$

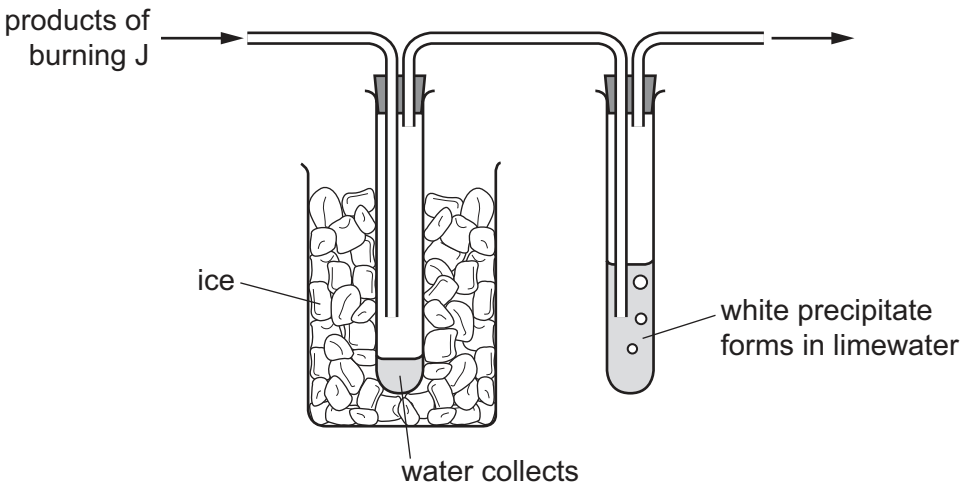
2 $C_{14}H_{30} \rightarrow H_2 + C_2H_4 + C_3H_6 + C_4H_8 + C_5H_{10}$

3 $C_{14}H_{30} \rightarrow C_2H_6 + 4C_3H_6$

4 $C_{14}H_{30} \rightarrow C_2H_6 + C_3H_8 + C_9H_{18}$

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

38 The products formed by burning substance J are passed through the apparatus shown.



What is substance J?

A carbon monoxide

B ethanol

C hydrogen

D sulfur

39 Which statements about ethanoic acid are correct?

1 Aqueous ethanoic acid reacts with magnesium to form magnesium ethanoate.

2 Carbon dioxide is formed when aqueous ethanoic acid reacts with sodium carbonate.

3 Hydrogen is formed when aqueous ethanoic acid reacts with sodium hydroxide.

4 Ethanoic acid turns red litmus paper blue.

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

40 Which statement about polymerisation is correct?

A Large monomer molecules join to form small polymer molecules.

B Large polymer molecules join to form small monomer molecules.

C Small monomer molecules join to form large polymer molecules.

D Small polymer molecules join to form large monomer molecules.

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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 –		114 Fl flerovium –		116 Lv livermorium –		

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.).