Cambridge Assessment International Education

Cambridge IGCSE™ (9–1)

CHEMISTRY **0971/12**

Paper 1 Multiple Choice (Core) **October/November 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 Which statement describes the particles in a liquid?

A They are close together but have no regular arrangement.

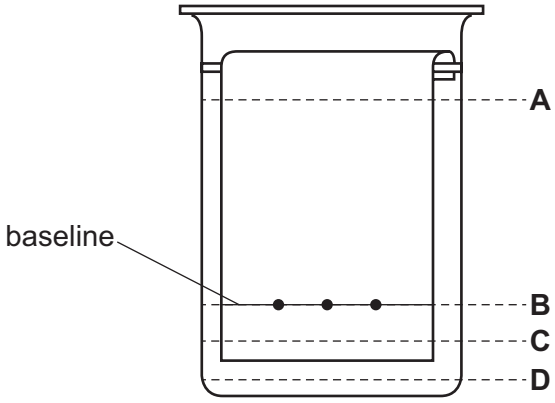
B They are densely packed in a regular order.

C They move freely at high speed and are widely spaced.

D They vibrate but do not move from a fixed position.

2 The apparatus used in a chromatography experiment is shown.

Which line shows the starting depth of the solvent in the beaker?



3 Filtration is used to separate mixtures.

Which type of mixture is separated by filtration?

A an insoluble solid from a liquid

B a liquid solvent from a solution

C a dissolved solid from a solution

D a liquid from a mixture of liquids

4 How many neutrons are present in one atom of $^{35}_{17}Cl$?

A 17 **B** 18 **C** 35 **D** 52

5 Which statement about an alloy is correct?

A It is a compound made of two or more elements, one of which is a metal.

B It is a layer of a metal plated onto another metal.

C It is a mixture of a metal with one or more other elements.

D It is a single element.

6 Which statement about compounds is correct?

A Covalent compounds are less volatile than ionic compounds.

B Covalent compounds conduct electricity when they are solid.

C Ionic compounds conduct electricity when molten.

D Ionic compounds are insoluble in water.

7 Which statement explains why diamond is used in cutting tools?

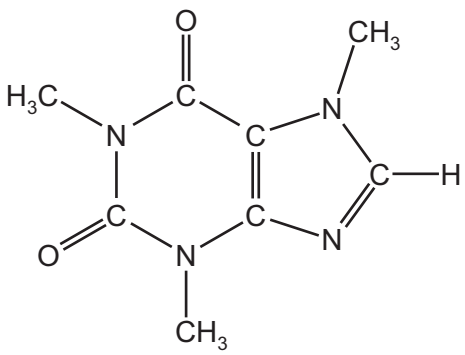
A It has no free electrons.

B It has a high melting point.

C It is colourless.

D It is hard.

8 Caffeine is a stimulant found in coffee.



caffeine

Which formula represents caffeine?

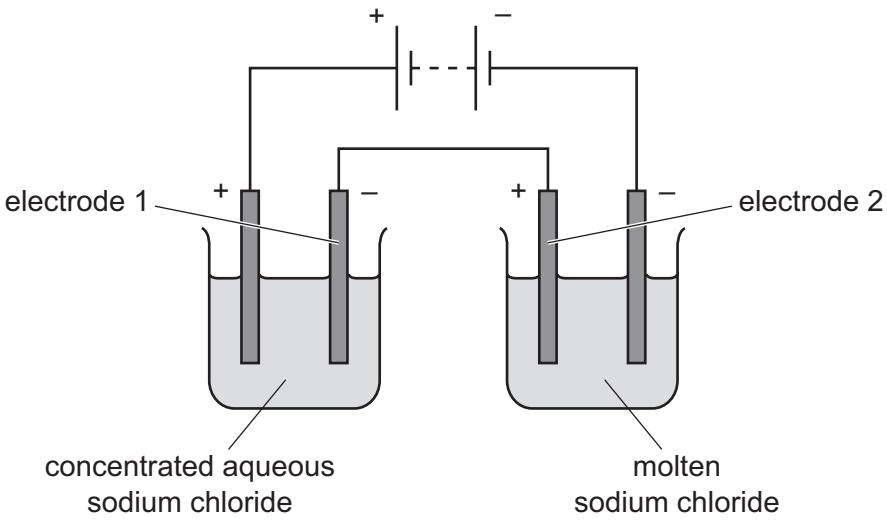
A $C_7H_{10}N_4O_2$ **B** $C_8H_{10}N_3O_2$ **C** $C_8H_{10}N_4O_2$ **D** $C_8H_{11}N_4O_2$

9 What is the relative formula mass of ammonium sulfate, $(NH_4)_2SO_4$?

A 63 **B** 114 **C** 118 **D** 132

[Turn over

10 The electrolysis of concentrated aqueous sodium chloride and molten sodium chloride is shown.



What are the products at electrodes 1 and 2?

	electrode 1	electrode 2
A	chlorine	chlorine
B	hydrogen	chlorine
C	hydrogen	sodium
D	sodium	sodium

11 When an acid is added to an alkali, the temperature of the reaction mixture rises.

Which words describe this reaction?

A decomposition and endothermic

B decomposition and exothermic

C neutralisation and endothermic

D neutralisation and exothermic

12 Some properties of four fuels are shown.

Which fuel is a gas at room temperature and makes two products when it burns in a plentiful supply of air?

	fuel	formula	melting point / °C	boiling point / °C
A	hydrogen	H_2	–259	–253
B	methane	CH_4	–182	–164
C	octane	C_8H_{18}	–57	126
D	wax	$C_{31}H_{64}$	60	400

13 Which process is a physical change?

A burning wood

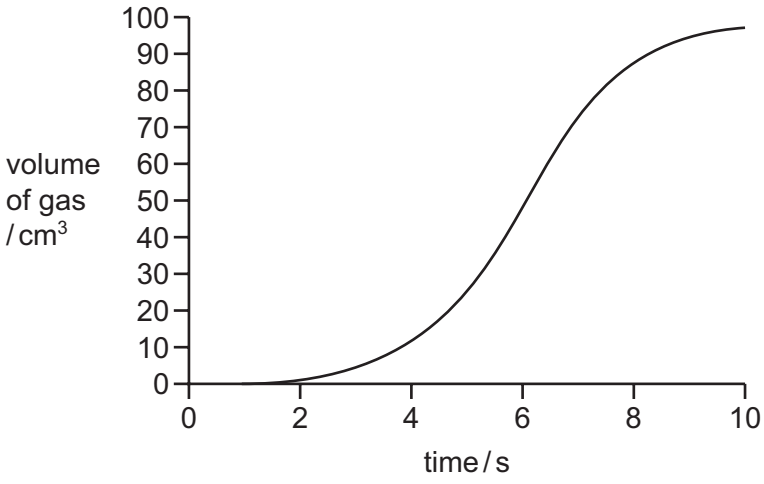
B cooking an egg

C melting an ice cube

D rusting iron

14 The volume of gas given off in a chemical reaction is measured over time.

The results are shown.



At which time is the rate of reaction greatest?

A 0 s **B** 4 s **C** 6 s **D** 10 s

[Turn over

15 Which row describes the colours of the named salts?

	hydrated copper(II) sulfate	hydrated cobalt(II) chloride	anhydrous copper(II) sulfate	anhydrous cobalt(II) chloride
A	blue	blue	white	pink
B	blue	pink	white	blue
C	white	blue	blue	pink
D	white	pink	blue	white

16 When magnesium is heated with zinc oxide a reaction occurs.

The equation is shown.

$$Mg + ZnO \rightarrow MgO + Zn$$

Which substance is oxidised?

A magnesium

B magnesium oxide

C zinc

D zinc oxide

17 X and Y are oxides of two different elements.

- X reacts with water to produce aqueous solution Z.
- Z turns universal indicator paper blue.
- An aqueous solution of Y reacts with sodium carbonate to produce carbon dioxide gas.

Which statement is correct?

A X and Y are both the oxides of metals.

B X and Y are both the oxides of non-metals.

C X is the oxide of a metal and Y is the oxide of a non-metal.

D X is the oxide of a non-metal and Y is the oxide of a metal.

18 Copper(II) sulfate is made by reacting excess insoluble solid M and solution N.

Which row identifies M and N and the method used to extract crystals of copper(II) sulfate from the mixture?

	M	N	method
A	copper	sodium sulfate	crystals are filtered out from the mixture
B	copper	sulfuric acid	mixture is filtered and the filtrate evaporated until crystals form
C	copper(II) carbonate	sulfuric acid	mixture is filtered and the filtrate evaporated until crystals form
D	copper(II) oxide	sulfuric acid	mixture is filtered and the residue dried

19 Which row shows the observation when a few drops of aqueous P is added to concentrated aqueous Q?

	P	Q	observation
A	acidified potassium manganate(VII)	sodium sulfite	purple solution
B	sodium hydroxide	zinc chloride	white precipitate
C	ammonia	potassium carbonate	fizzing
D	barium chloride	iron(III) sulfate	brown precipitate

20 Which statement about the Periodic Table is correct?

A Elements in the same group have the same number of electron shells.

B Elements are arranged in order of increasing proton number.

C Metals are on the right and non-metals are on the left.

D The most reactive elements are at the bottom of every group.

[Turn over

21 Elements J and K are in the same period in the Periodic Table.

J reacts with acids to produce a salt and hydrogen.

K reacts with sodium to form an ionic compound.

Which statement about J and K is correct?

A An atom of J has more electrons than an atom of K.

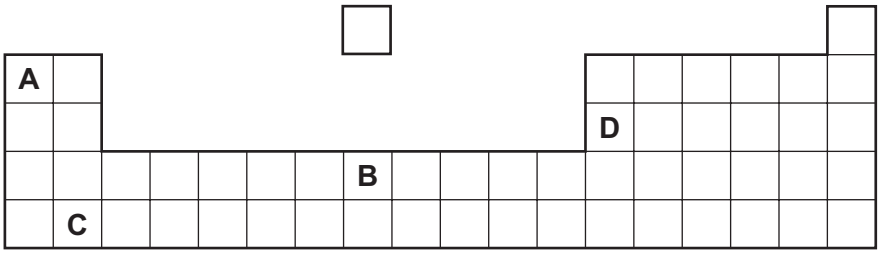
B J and K are both metals.

C J and K are both non-metals.

D J is to the left of K in the Periodic Table.

22 Part of the Periodic Table is shown.

Which element has a high density, a high melting point and forms a brown oxide?



23 Gas G has 10 electrons. Gas H has eight more electrons than gas G. Both gases are monoatomic.

Which statement about G and H is correct?

A Both gases are in the same group of the Periodic Table.

B Both gases are in the same period of the Periodic Table.

C Both gases are very reactive.

D Gas G has a higher atomic mass than gas H.

24 Which property is correct for all metals?

A They are good conductors of electricity.

B They are hard.

C They have high melting points.

D They react with dilute acids.

25 Silver is below copper in the reactivity series.

Which row describes the reactions of silver?

	reaction with steam	reaction with dilute hydrochloric acid
A	no reaction	no reaction
B	no reaction	reacts to produce hydrogen gas
C	reacts to produce hydrogen gas	no reaction
D	reacts to produce hydrogen gas	reacts to produce hydrogen gas

26 Which types of reaction do hematite and limestone undergo in the blast furnace?

	hematite	limestone
A	reduction	reduction
B	reduction	thermal decomposition
C	thermal decomposition	reduction
D	thermal decomposition	thermal decomposition

27 Some properties and uses of different metals are shown.

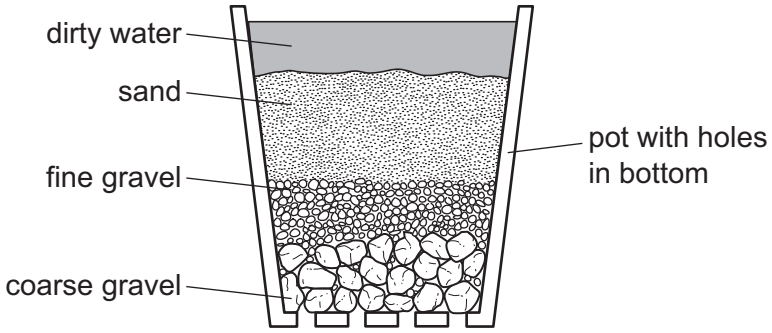
	metal	property	use
1	aluminium	low density	aircraft
2	copper	good conductor of electricity	electrical wiring
3	copper	poor conductor of heat	cooking utensils
4	stainless steel	corrodes easily	cutlery

Which rows link a use of the metal to its stated property?

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

[Turn over

28 The diagram shows a stage in the purification of dirty water.



Which process does this apparatus show?

A chlorination

B condensation

C distillation

D filtration

29 Which substance in polluted air damages stonework and kills trees?

A carbon dioxide

B carbon monoxide

C lead compounds

D sulfur dioxide

30 Ammonium nitrate, NH_4NO_3, is a fertiliser and is added to fields to help crops grow.

Slaked lime, $Ca(OH)_2$, is an alkali and is added to fields to reduce the acidity of the soil.

Ammonium nitrate and slaked lime should not be added to a field at the same time because they react with each other to form a gas, Z.

What is Z?

A ammonia

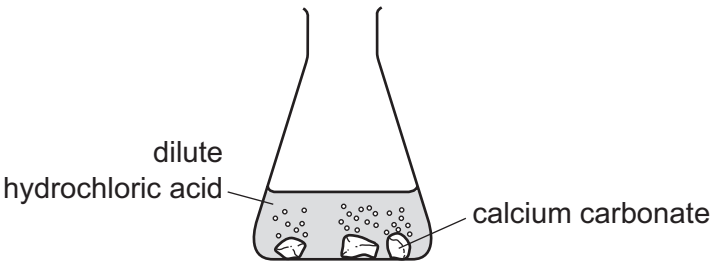
B hydrogen

C nitrogen

D oxygen

31 Four reactions are shown.

1



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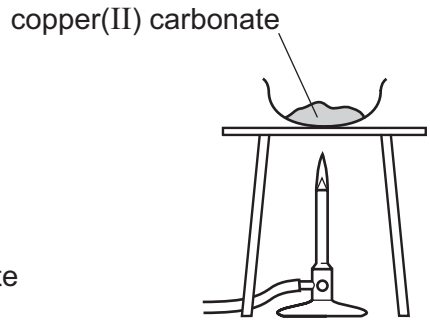

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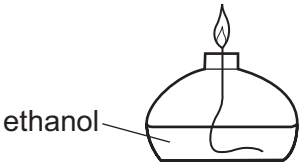

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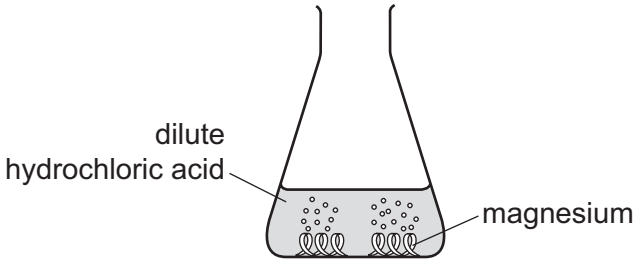

Which reactions produce water?

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

32 Which element has an oxide that is used as a food preservative?

A helium

B hydrogen

C iron

D sulfur

33 Which substance gives off carbon dioxide on heating?

A lime

B limestone

C limewater

D slaked lime

[Turn over

34 Which statement about both ethane and ethanol is correct?

A They are hydrocarbons.

B They contain oxygen.

C They contain the same number of atoms.

D They produce water when burned.

35 Fuel oil and naphtha are two fractions obtained from petroleum.

What are the major uses of these fractions?

	fuel oil	naphtha
A	jet fuel	making chemicals
B	jet fuel	making roads
C	ship fuel	making chemicals
D	ship fuel	making roads

36 Which homologous series of compounds reacts to form an addition polymer?

A alcohols

B alkanes

C alkenes

D carboxylic acids

37 What is the total number of shared electrons in ethane, C_2H_6?

A 6 **B** 7 **C** 12 **D** 14

38 Which process produces ethanol from glucose?

A catalytic addition

B cracking

C fermentation

D polymerisation

39 Which statement about unsaturated hydrocarbons is correct?

A $CH_3CH_2CH=CHCH_3$ is an unsaturated hydrocarbon.

B Ethene has more hydrogen atoms per molecule than ethane.

C Unsaturated hydrocarbons have double bonds between carbon and hydrogen atoms.

D Unsaturated hydrocarbons turn aqueous bromine from colourless to brown.

40 An organic compound X contains two carbon atoms in each molecule.

X reacts with aqueous sodium carbonate to give carbon dioxide.

What is compound X?

A ethanol

B ethane

C $CH_2=CH_2$

D CH_3COOH

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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.).