Cambridge Assessment International Education

Cambridge IGCSE™

CHEMISTRY **0620/13**

Paper 1 Multiple Choice (Core) **October/November 2021**

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 particles in a substance are far apart, randomly arranged and moving.

The substance changes state and the particles are now close together. The particles are still randomly arranged and able to move.

What is the change of state of the substance?

A gas to liquid

B liquid to gas

C liquid to solid

D solid to gas

2 A student put exactly 25.00 cm^3 of dilute hydrochloric acid into a conical flask.

The student added 2.5 g of solid sodium carbonate and measured the change in temperature of the mixture.

Which apparatus does the student need to use?

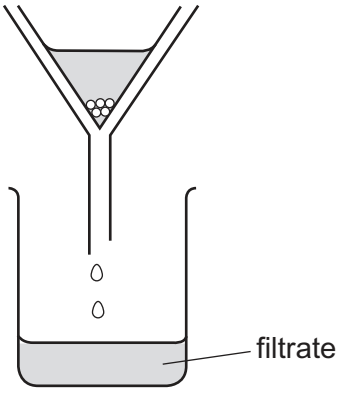
A balance, measuring cylinder, thermometer

B balance, pipette, stopwatch

C balance, pipette, thermometer

D burette, pipette, thermometer

3 A student separates sugar from pieces of broken glass by dissolving the sugar in water and filtering off the broken glass.



What is the filtrate?

A broken glass only

B broken glass and sugar solution

C pure water

D sugar solution

4 The nucleus of a particular atom consists of nineteen particles.

Nine of them are positively charged and ten of them are uncharged.

Which statement about this nucleus is correct?

A The nucleus has a nucleon number of nine.

B The nucleus has a nucleon number of ten.

C The nucleus has a proton number of nine.

D The nucleus has a proton number of ten.

5 Which description of brass is correct?

A alloy

B compound

C element

D non-metal

6 A Group I element combines with a Group VII element and forms an ionic bond.

Which row shows how the electronic structures change?

	Group I element		Group VII element	
	before bonding	after bonding	before bonding	after bonding
A	2,8,1	2,8,2	2,7	2,6
B	2,8	2,7	2,8	2,8,1
C	2,8,1	2,8	2,7	2,8
D	2,8	2,8,1	2,8	2,7

[Turn over

7 Four covalent compounds are listed.

chlorine

methane

ammonia

water

Which row identifies the total number of covalent bonds in each compound?

	chlorine	methane	ammonia	water
A	2	4	3	2
B	1	3	2	2
C	2	3	2	3
D	1	4	3	2

8 Magnesium reacts with dilute hydrochloric acid to produce a salt and hydrogen gas.

What is the equation for this reaction?

A $Mg + HCl \rightarrow MgCl + H$

B $Mg + H_2Cl_2 \rightarrow MgCl_2 + H_2$

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

D $Mg + 2HCl \rightarrow MgCl_2 + 2H$

9 The formula of sodium chlorate(V) is $NaClO_3$.

What is the relative formula mass of sodium chlorate(V), $NaClO_3$?

A 52.0 **B** 74.5 **C** 106.5 **D** 223.5

10 Effervescence is observed at the negative electrode (cathode) during the electrolysis of concentrated aqueous sodium chloride.

Which element is produced at the negative electrode (cathode)?

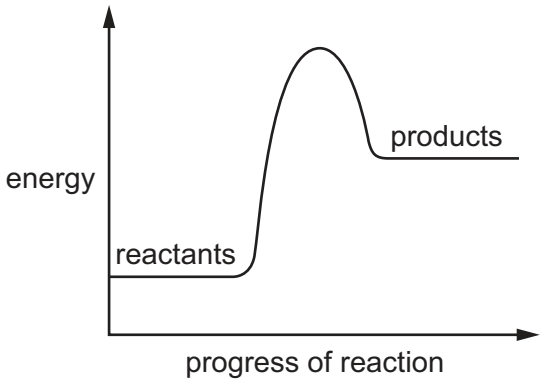
A chlorine

B hydrogen

C oxygen

D sodium

11 The energy level diagram for a chemical reaction is shown.



Which statement about this reaction is correct?

A The reaction is endothermic and energy is given out to the surroundings.

B The reaction is endothermic and energy is taken in from the surroundings.

C The reaction is exothermic and energy is given out to the surroundings.

D The reaction is exothermic and energy is taken in from the surroundings.

12 Which property explains why methane is used as a fuel?

A It is an alkane.

B It forms carbon dioxide when it burns.

C It is a gas at room temperature.

D It releases heat energy when it burns.

13 Solid copper(II) carbonate reacts with dilute sulfuric acid.

$$CuCO_3 + H_2SO_4 \rightarrow CuSO_4 + CO_2 + H_2O$$

The rate of the reaction can be changed by varying the conditions.

Which changes always increase the rate of this chemical reaction?

1 increasing the concentration of sulfuric acid

2 increasing the size of the pieces of copper(II) carbonate

3 increasing the temperature

4 increasing the volume of sulfuric acid

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

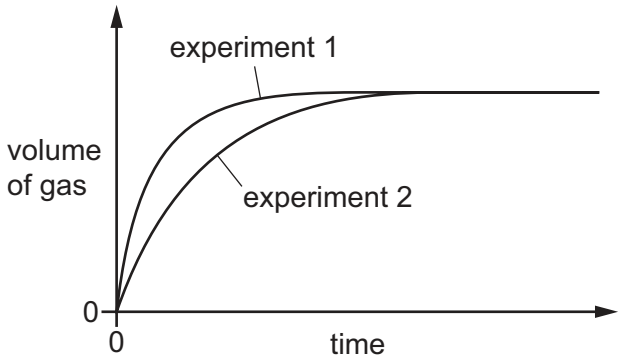
14 Magnesium carbonate and hydrochloric acid react to form a gas.

The volume of gas is measured at fixed time intervals.

In experiment 1, an excess of magnesium carbonate granules reacts with 100 cm^3 of hydrochloric acid.

The experiment is repeated but with one change. This is experiment 2.

The results are shown on the graph.



Which change is made?

A A catalyst is added.

B Magnesium carbonate powder is used.

C The hydrochloric acid is more concentrated.

D The temperature is lower.

15 Which colour change is observed when water is added to anhydrous cobalt(II) chloride?

A blue to pink

B pink to blue

C blue to white

D white to blue

16 The equation for the extraction of iron from its ore is shown.

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

Which statement is correct?

A Iron is oxidised.

B Iron(III) oxide is oxidised.

C Carbon monoxide is oxidised.

D Carbon monoxide is reduced.

17 Solution X is tested separately with sodium carbonate and litmus.

Which row shows that X is acidic?

	sodium carbonate	litmus
A	effervescence	blue
B	effervescence	red
C	no change	blue
D	no change	red

18 Basic oxides are neutralised by acidic oxides.

Which element forms an oxide that neutralises calcium oxide?

A hydrogen

B magnesium

C sodium

D sulfur

19 Which method produces a pure sample of copper(II) sulfate crystals?

A Add an excess of copper(II) carbonate to dilute sulfuric acid, filter and evaporate the filtrate until crystals start to appear.

B Add an excess of copper(II) carbonate to dilute sulfuric acid, filter off the remaining solid and dry it in an oven at 100 °C.

C Warm an excess of copper(II) oxide with dilute sulfuric acid and evaporate the mixture to dryness.

D Warm an excess of copper(II) oxide with dilute sulfuric acid and filter off the crystals formed.

20 Which statement about aqueous sodium hydroxide is correct?

A When it is added to a solution containing sulfate ions, a white precipitate is formed.

B When it is added to a solution of copper(II) ions, a blue precipitate is formed which dissolves in excess to give deep blue solution.

C When it is added to a solution of iron(II) ions, a green precipitate is formed which does not dissolve in excess.

D When it is added to ammonium chloride, a gas is produced which turns blue litmus red.

21 A period of the Periodic Table is shown.

group	I	II	III	IV	V	VI	VII	VIII
element	R	S	T	V	W	X	Y	Z

The letters are not their chemical symbols.

Which statement is correct?

A Element R does not conduct electricity.

B Elements R and Y react together to form an ionic compound.

C Element Z exists as a diatomic molecule.

D Element Z reacts with element T.

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

Which statement about sodium is correct?

A Sodium is more dense than potassium.

B Sodium reacts with water more vigorously than lithium.

C Sodium has a lower melting point than potassium.

D Solid sodium does not conduct electricity.

23 Which property of transition elements is different from the properties of Group I metals?

A They conduct electricity.

B They are malleable.

C They form coloured compounds.

D They form basic oxides.

24 The noble gases are in Group VIII of the Periodic Table.

Which statement explains why noble gases are unreactive?

A They all have eight electrons in their outer shells.

B They all have full outer shells.

C They are all gases.

D They are all monoatomic.

25 Which statement is correct for **all** metals?

A They conduct electricity when molten.

B They gain electrons when they form ions.

C They have a low density.

D They have a low melting point.

26 Chromium is a more reactive metal than iron but less reactive than zinc.

Which statements are correct?

1 Chromium does not react with dilute hydrochloric acid.

2 Chromium oxide is reduced when it is heated with carbon.

3 Chromium reacts with zinc oxide to form zinc.

4 Chromium reacts with steam to form hydrogen gas.

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

27 Some properties of copper are listed.

1 It conducts electricity.

2 It conducts heat.

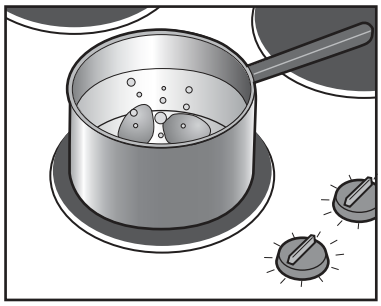
3 It is ductile.

4 It has a high melting point.

Which properties of copper make it useful as a cooking pan?

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

28 The diagrams show some uses of water in the home.



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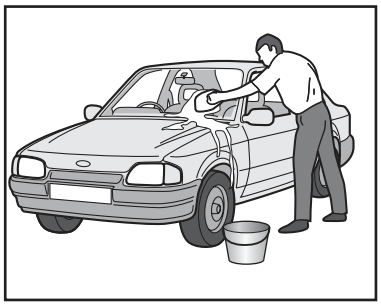

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For which uses is it important for the water to have been treated?

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

29 Which gas is released when slaked lime, $Ca(OH)_2$, is added to a field that has previously been treated with ammonium sulfate fertiliser?

A ammonia

B carbon dioxide

C nitrogen

D sulfur dioxide

30 Which reactions produce carbon dioxide?

1 heating a carbonate

2 reacting a carbonate with dilute acid

3 burning methane

4 cracking a hydrocarbon

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

31 Sulfur burns to make sulfur dioxide.

Which row describes a source of sulfur and a use of sulfur dioxide?

	source of sulfur	use of sulfur dioxide
A	the air	food preservative
B	the air	treating acidic soils
C	underground deposits	food preservative
D	underground deposits	treating acidic soils

32 Lime (calcium oxide) is used to treat waste water from a factory.

Which substance is removed by the lime?

A ammonia

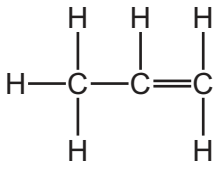
B sodium chloride

C sodium hydroxide

D sulfuric acid

33 The structures of three chemical compounds are shown.

1



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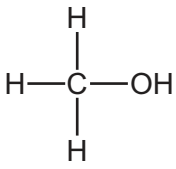

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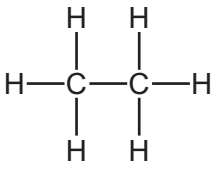

To which homologous series do 1, 2 and 3 belong?

	1	2	3
A	alkane	alcohol	alkene
B	alkene	alkane	alcohol
C	alkane	alkene	alcohol
D	alkene	alcohol	alkane

34 Fuel X produces carbon dioxide and water when it is burned in air. So does fuel Y.

What could X and Y be?

	X	Y
A	C	H_2
B	C	C_8H_{18}
C	CH_4	H_2
D	CH_4	C_8H_{18}

35 What is the main constituent of natural gas?

A hydrogen

B carbon monoxide

C methane

D nitrogen

36 Which statement describes the members of a homologous series?

A compounds with the same physical properties

B compounds containing the same functional group

C compounds containing the same number and type of bonds

D compounds obtained from the same raw material

37 Which monomer molecules are used to make poly(ethene)?

A C_2H_4 **B** C_2H_6 **C** C_3H_6 **D** C_4H_8

38 Ethanol is manufactured by the catalytic addition of steam to compound P.

What is P?

A ethane

B ethene

C methane

D yeast

39 Which property is shown by aqueous ethanoic acid?

A It reacts with magnesium to form water.

B It turns red litmus blue.

C It reacts with copper to form hydrogen gas.

D It reacts with copper(II) carbonate to form carbon dioxide gas.

40 Which statement about polymers is correct?

A All synthetic polymers rapidly break down in landfill sites.

B Nylon is a natural polymer.

C Proteins are non-biodegradable natural polymers.

D Synthetic polymers are harmful to marine life.

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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.).