Cambridge Assessment International Education

Cambridge IGCSE™

CHEMISTRY **0620/13**

Paper 1 Multiple Choice (Core) **October/November 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 conditions cause gas particles to move the fastest and the furthest apart?

	temperature	pressure
A	high	high
B	low	high
C	high	low
D	low	low

2 Which statement describes a liquid at room temperature?

A A sample of a liquid has a fixed volume and shape.

B A sample of a liquid does **not** have a fixed volume or shape.

C The particles are touching but can move by sliding over each other.

D The particles spread out and fill all available space.

3 A compound, X, has a melting point of 71 °C and a boiling point of 375 °C.

Which statement about X is correct?

A It is a liquid at 52 °C and a gas at 175 °C.

B It is a liquid at 69 °C and a gas at 380 °C.

C It is a liquid at 75 °C and a gas at 350 °C.

D It is a liquid at 80 °C and a gas at 400 °C.

4 What is the nucleon number of an atom?

A the number of neutrons

B the number of protons

C the total number of protons and neutrons

D the total number of protons and electrons

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5 An atom has three electron shells. There are three electrons in the outer shell.

How many protons and how many neutrons are in this atom?

	protons	neutrons
A	13	14
B	13	27
C	14	13
D	21	24

6 Which row gives the number of covalent bonds in **one** molecule of ammonia and in **one** molecule of hydrogen chloride?

	ammonia	hydrogen chloride
A	3	1
B	3	2
C	4	1
D	4	2

7 Which statements about the structure and bonding in diamond are correct?

1 Each carbon atom in diamond is bonded to three other carbon atoms only.

2 Diamond contains many strong covalent bonds.

3 Diamond contains layers of carbon atoms, which can slide over each other.

4 Diamond has a giant structure.

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

8 Magnesium burns in oxygen to form magnesium oxide.

The equation for the reaction is shown.

$$2Mg + O_2 \rightarrow 2MgO$$

Which mass of magnesium oxide is formed when 48 g of magnesium is burned?

A 20 g **B** 40 g **C** 80 g **D** 160 g

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9 Propane, C_3H_8, is burned in a limited amount of oxygen.

Which equation represents this reaction?

A $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

B $C_3H_8 + 4O_2 \rightarrow 3CO + 4H_2O$

C $C_3H_8 + 4O_2 \rightarrow 3CO_2 + 2H_2O + 2H_2$

D $2C_3H_8 + 7O_2 \rightarrow 6CO + 8H_2O$

10 The isotope of which element is used to define the relative atomic mass of other elements?

A sulfur

B oxygen

C nitrogen

D carbon

11 What is the definition of electrolysis?

A the formation of a positive ion by the removal of electrons using an electric current

B the decomposition of an ionic compound, when molten or in aqueous solution, by the passage of an electric current

C the substance containing ions through which an electric current can pass

D the coating of a metal with a different metal by passing an electric current through an aqueous solution of an ionic salt

12 Which statement about electroplating a copper spoon with silver is correct?

A Both the anode and cathode are made of carbon.

B The copper spoon is the anode.

C Aqueous copper(II) sulfate is the electrolyte.

D Silver is formed at the negative electrode.

13 Which row describes the reaction pathway diagram and energy change in an exothermic reaction?

	reaction pathway diagram	energy is
A	reactants higher than products	absorbed
B	reactants higher than products	released
C	reactants lower than products	absorbed
D	reactants lower than products	released

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14 The table shows the initial and final temperatures for four different reactions.

reaction	initial temperature / °C	final temperature / °C
1	19	28
2	18	16
3	20	20
4	18	19

Which reactions are endothermic?

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

15 Which process is a chemical change?

A boiling water

B cooking an egg

C dissolving sugar

D melting ice cubes

16 A student reacts strips of zinc with dilute sulfuric acid and measures the time taken to produce 100 cm^3 of hydrogen.

The experiment is repeated using different conditions.

The results are shown in the table.

experiment	time to produce 100 cm^3 of hydrogen / s
1	250
2	100

Which changes in conditions produce the results shown in experiment 2?

1 Add a catalyst.

2 Dilute the acid.

3 Use zinc powder.

4 Heat the acid.

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

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17 When blue copper(II) sulfate is heated, a white solid and water are formed.

The white solid turns blue and gives out heat when water is added to it.

Which terms describe the blue copper(II) sulfate and the reactions?

	blue copper(II) sulfate is	reactions
A	a mixture	can be reversed
B	a mixture	**cannot** be reversed
C	hydrated	can be reversed
D	hydrated	**cannot** be reversed

18 Which statements about a redox reaction are correct?

1 Oxidation is the gain of oxygen.

2 Both oxidation and reduction take place in a redox reaction.

3 Reduction is the gain of oxygen.

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

19 Which row identifies a basic oxide and describes an alkali?

	basic oxide	description of an alkali
A	sodium oxide	insoluble base
B	sodium oxide	soluble base
C	sulfur dioxide	insoluble base
D	sulfur dioxide	soluble base

20 Which indicators turn blue when added to aqueous ammonia?

1 litmus

2 thymolphthalein

3 universal indicator

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

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21 Ammonium chloride reacts with solution X to produce alkaline gas Y. The equation is shown.

ammonium chloride + solution X $\rightarrow$ alkaline gas Y

Which row identifies X and Y?

	X	Y
A	hydrochloric acid	ammonia
B	hydrochloric acid	chlorine
C	sodium hydroxide	ammonia
D	sodium hydroxide	chlorine

22 The solubility of some salts is shown.

	chloride	nitrate	sulfate	carbonate
barium	soluble	soluble	insoluble	insoluble
lead(II)	insoluble	soluble	insoluble	insoluble
potassium	soluble	soluble	soluble	soluble
zinc	soluble	soluble	soluble	insoluble

Which two aqueous solutions produce an insoluble salt when mixed together?

A barium chloride and zinc nitrate

B barium nitrate and lead(II) nitrate

C lead(II) nitrate and potassium carbonate

D potassium nitrate and zinc sulfate

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[Turn over

23 The table shows some properties of the halogens.

halogen	melting point / °C	colour at room temperature	state at room temperature
chlorine	–101	yellow-green	gas
bromine	–7	red-brown	liquid
iodine	114	grey-black	solid
astatine			

Which statement describes astatine?

A It is a yellow gas at room temperature.

B It is a black liquid at room temperature.

C Its melting point is higher than the melting point of bromine but lower than that of chlorine.

D Its melting point is higher than the melting point of both iodine and bromine.

24 J, L and M are elements in the Periodic Table.

- J has the highest density.
- L has the highest reactivity with water.
- M has the highest atomic number.

Which row identifies the elements J, L and M?

	J	L	M
A	copper	lithium	bromine
B	lithium	copper	bromine
C	bromine	lithium	copper
D	copper	bromine	lithium

25 Which statement about elements in Group I of the Periodic Table is correct?

A Rubidium has a greater density than caesium.

B Lithium has a higher melting point than potassium.

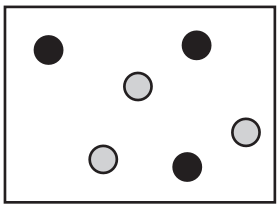
C Potassium is more reactive than rubidium.

D Rubidium atoms have more outer shell electrons than sodium atoms.

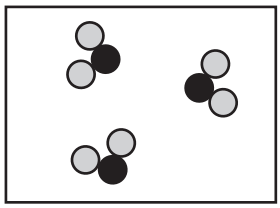
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26 Which diagram shows a mixture of noble gases?

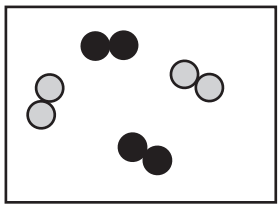
A



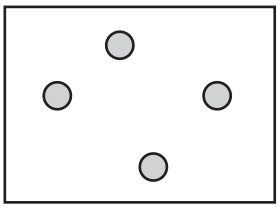
B



C



D



27 Which statements about the alloy brass are correct?

1 It is harder than pure copper.

2 It does **not** conduct electricity.

3 It is a mixture of copper and nickel.

4 It is stronger than pure copper.

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

28 The bodies of aircraft are often made using aluminium.

Which two properties of aluminium make it suitable for this use?

	property 1	property 2
A	good conductor of electricity	good conductor of heat
B	good conductor of electricity	strong
C	good conductor of heat	low density
D	strong	low density

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[Turn over

29 Four metals, P, Q, R and S, are added separately to water and to dilute hydrochloric acid.

The table shows the results.

	observation with water	observation with dilute hydrochloric acid
P	no reaction	fizzes slowly
Q	fizzes rapidly	fizzes rapidly
R	no reaction	no reaction
S	fizzes slowly	fizzes rapidly

Which conclusion can be made from these observations?

A P is the least reactive of the four metals.

B Q is more reactive than S.

C Q is less reactive than P.

D R is the most reactive of the four metals.

30 Iron is extracted from its ore in the blast furnace.

Which statement about one of the reactions in the blast furnace is correct?

A Carbon monoxide is reduced to carbon dioxide.

B Iron(III) oxide is reduced by carbon dioxide.

C Slag is produced when calcium carbonate reacts with carbon dioxide.

D The reaction that heats the blast furnace produces carbon dioxide.

31 Which pollutants found in river water lead to deoxygenation?

1 nitrates

2 harmful microbes

3 metal compounds

4 phosphates

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

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32 Three effects of air pollutants are listed.

1 photochemical smog

2 respiratory problems

3 acid rain

Which effects are caused by oxides of nitrogen?

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

33 Fractional distillation is used to separate petroleum into its fractions.

Which statement about the fractional distillation of petroleum is correct?

A The kerosene fraction is used as a fuel for ships.

B The fractions with the highest boiling points are extracted from the top of the fractionating column.

C The naphtha fraction contains larger hydrocarbon molecules than the lubricating oil fraction.

D The refinery gas fraction contains hydrocarbon molecules which consist of five atoms.

34 Fertilisers are mixtures of different compounds used to increase the growth of crops.

Which pair of substances contain the three essential elements for plant growth?

A ammonium nitrate and calcium phosphate

B ammonium nitrate and potassium chloride

C ammonium phosphate and potassium chloride

D potassium nitrate and calcium carbonate

35 Which row gives the relative molecular mass, M_r, of the first member of the named homologous series?

	homologous series	M_r
A	alkanes	12
B	alkenes	14
C	alcohols	32
D	carboxylic acids	60

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36 A hydrocarbon decolourises bromine water.

Which statement about the hydrocarbon is correct?

A It is an alkane.

B Its molecular formula is C_2H_6.

C It is a saturated hydrocarbon.

D It has the general formula C_nH_{2n}.

37 Which statement describes how ethanol is manufactured from ethene?

A Steam is added to ethene using an acid catalyst at 30 °C.

B Steam is added to ethene using an acid catalyst at 300 °C.

C Ethene is fermented using yeast at 30 °C.

D Ethene is fermented using yeast at 300 °C.

38 Ethanoic acid reacts with aqueous sodium carbonate.

Which gas is given off in this reaction?

A hydrogen

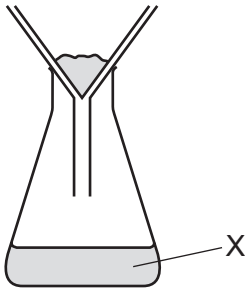
B carbon dioxide

C carbon monoxide

D oxygen

39 A mixture containing an aqueous salt, sand and hot water is stirred.

The mixture is then poured into the apparatus shown.



What is X?

A a filtrate only

B a residue only

C a solute only

D a solvent only

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40 A scientist uses a titration to calculate the concentration of acid in a sample of lemon juice.

A measured volume of aqueous lemon juice and a few drops of an indicator are added to a flask.

The aqueous lemon juice is then titrated against $0.1\,\text{mol}/\text{dm}^3$ aqueous sodium hydroxide.

Which piece of apparatus is used to add the aqueous sodium hydroxide to the flask?

A a burette

B a delivery tube

C a measuring cylinder

D a volumetric pipette

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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.).