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International Education

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CHEMISTRY **0620/23**

Paper 2 Multiple Choice (Extended) **May/June 2026**

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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[Turn over

1 Gaseous ammonia reacts with an excess of gaseous hydrogen chloride in a sealed flask.

$$NH_3(g) + HCl(g) \rightarrow NH_4Cl(s)$$

The reaction is exothermic.

Which statements about the reaction are correct?

1 The number of gas particles in the flask decreases.

2 The average kinetic energy of the gas particles increases.

3 The activation energy of the reaction increases.

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

2 X and Y are changes of state of water.

$$\text{ice} \underset{}{\overset{X}{\rightleftharpoons}} \text{liquid water} \underset{Y}{\rightleftharpoons} \text{water vapour}$$

Which row identifies X and Y?

	X	Y
A	freezing	boiling
B	freezing	condensing
C	melting	boiling
D	melting	condensing

3 A syringe contains a fixed mass of gas. The plunger of the syringe is free to move.

Which row describes how the distance between the particles of the gas changes when the temperature or pressure is reduced?

	reduced temperature	reduced pressure
A	particles move closer together	particles move closer together
B	particles move closer together	particles move further apart
C	particles move further apart	particles move closer together
D	particles move further apart	particles move further apart

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4 Which substance is a pure compound?

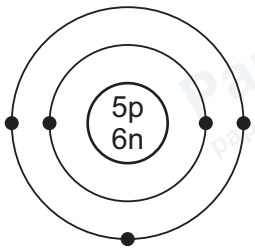
A air

B brass

C ethanol

D petroleum

5 The diagram shows the structure of an atom of element J.



key

● electron
n neutron
p proton

What is element J?

A boron

B carbon

C sodium

D sulfur

6 Which statement about an atom or an ion is correct?

A In an atom, the number of electrons is equal to the atomic number.

B In an atom, the number of neutrons is equal to the atomic number.

C In a sodium ion, Na^+, the number of electrons is greater than the atomic number.

D An atom of hydrogen that contains one neutron has an atomic number of two.

7 Which statement explains the high melting point of potassium bromide?

A There is strong covalent bonding between the molecules.

B There is strong ionic bonding between the ions.

C There are strong intermolecular forces between the molecules.

D There are strong intermolecular forces between the ions.

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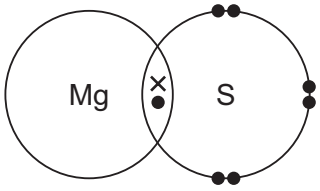
8 Magnesium is in Group II and sulfur is in Group VI of the Periodic Table.

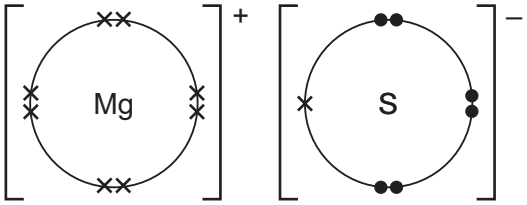
They react to form magnesium sulfide.

Which dot-and-cross diagram shows the outer electrons in magnesium sulfide?

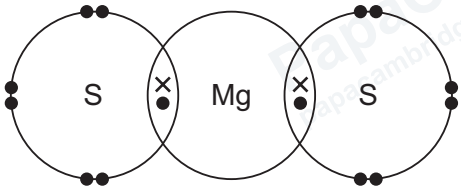
A



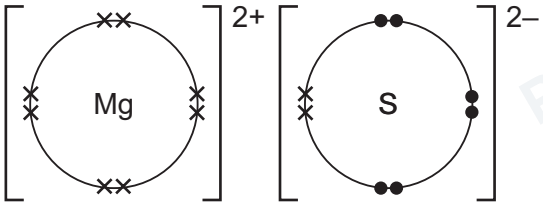
B



C



D



9 Graphite is a form of carbon.

Why can graphite be used as a lubricant?

A Graphite contains unbonded electrons which move through the structure.

B Graphite contains weak covalent bonds, so the atoms move easily.

C Graphite has a low melting point, so it easily turns into a liquid.

D Graphite has weak attractive forces between layers, so they can move.

10 The formula of an aluminium ion is Al^{3+}.

The formula of a nitrate ion is NO_3^-.

What is the formula of aluminium nitrate?

A $AlNO_3$ **B** $Al(NO_3)_2$ **C** Al_3NO_3 **D** $Al(NO_3)_3$

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11 Organic compound X has the following percentage composition by mass.

carbon 60%; hydrogen 8%; oxygen 32%

What is the empirical formula of compound X?

A C_5H_4O **B** $C_5H_8O_2$ **C** $C_{10}H_8O_4$ **D** $C_{15}H_2O_8$

12 The equation for the reaction of dilute sulfuric acid and aqueous sodium hydroxide is shown.

$$H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$$

25.0 cm^3 of aqueous sodium hydroxide is measured into a conical flask.

12.5 cm^3 of 0.100 mol/dm^3 sulfuric acid is needed to completely react with the aqueous sodium hydroxide.

What is the concentration of the aqueous sodium hydroxide?

A 0.0250 mol/dm^3

B 0.0500 mol/dm^3

C 0.100 mol/dm^3

D 0.200 mol/dm^3

13 What is the total number of atoms in 0.0100 mol of methane, CH_4?

(The value of the Avogadro constant is 6.02×10^{23}.)

A 6.02×10^{21} **B** 6.02×10^{22} **C** 3.01×10^{22} **D** 3.01×10^{24}

14 Dilute sulfuric acid is electrolysed using carbon electrodes.

Which row shows the products that are formed at each electrode?

	anode	cathode
A	hydrogen	oxygen
B	hydrogen	sulfur
C	oxygen	hydrogen
D	oxygen	sulfur

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15 Substance Z is electrolysed with inert electrodes.

The only product at the positive electrode is a gas which bleaches damp blue litmus paper.

The only product at the negative electrode is a gas which gives a squeaky pop when it is tested with a lighted splint.

What could substance Z be?

1 concentrated aqueous copper(II)chloride

2 concentrated aqueous sodium chloride

3 dilute aqueous potassium chloride

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

16 Aluminium is manufactured from aluminium oxide by electrolysis.

Which row shows the ionic half-equations at each electrode and describes the role of cryolite in the process?

	reaction at anode	reaction at cathode	role of cryolite
A	$2O^{2-} \rightarrow O_2 + 4e^-$	$Al^{3+} + 3e^- \rightarrow 3Al$	catalyst
B	$Al^{3+} + 3e^- \rightarrow Al$	$2O^{2-} \rightarrow O_2 + 4e^-$	solvent for aluminium oxide
C	$2O^{2-} \rightarrow O_2 + 4e^-$	$Al^{3+} + 3e^- \rightarrow Al$	solvent for aluminium oxide
D	$Al^{3+} + 3e^- \rightarrow 3Al$	$2O^{2-} \rightarrow O_2 + 4e^-$	catalyst

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17 The equation for the reaction between hydrogen and chlorine is shown.

$$H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$$

The energy required to break the H–H bond is 436 kJ / mol.

The energy required to break the C*l*–C*l* bond is 242 kJ / mol.

The energy released when making the H–C*l* bond is 431 kJ / mol.

Which row shows the overall energy change in kJ / mol and identifies the type of reaction?

	energy change in kJ / mol	type of reaction
A	184	endothermic
B	184	exothermic
C	247	endothermic
D	247	exothermic

18 Magnesium reacts with hydrochloric acid to form magnesium chloride and hydrogen.

Why does magnesium powder react faster than magnesium ribbon?

A The magnesium atoms in the powder have a lower activation energy.

B The powder has a smaller surface area.

C The magnesium atoms in the powder have more frequent collisions with acid particles.

D The magnesium atoms in the powder have greater kinetic energy.

19 The equation for one of the reactions in the Contact process is shown.

$$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g) \qquad \Delta H = -196\ \text{kJ / mol}$$

Which statement about this reaction is correct?

A The typical conditions are a temperature of 450 °C and a pressure of 200 atm.

B The raw materials for this reaction are obtained from air and methane.

C Iron is normally used as the catalyst to increase the rate of reaction.

D Increasing the temperature increases the rate of reaction, but decreases the yield of SO_3.

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20 Which row describes the effect of a catalyst on a reaction?

	effect on activation energy, E_a	effect on enthalpy change, ΔH
A	decreases	decreases
B	decreases	no change
C	increases	decreases
D	increases	no change

21 The ionic equation for the reaction of aqueous iron(II) sulfate with acidified aqueous potassium manganate(VII) is shown.

$$5Fe^{2+} + MnO_4^- + 8H^+ \rightarrow 5Fe^{3+} + Mn^{2+} + 4H_2O$$

Which statement about the reaction is correct?

A The iron(II) ions gain electrons.

B The iron(II) ions act as an oxidising agent.

C The manganate(VII) ions are reduced.

D The oxidation state of the iron(II) ions decreases.

22 Which statement about ethanoic acid is correct?

A It is a weak acid that does **not** react with magnesium.

B It is made by oxidising ethanol with aqueous sodium carbonate.

C It reacts with an ester to form an alcohol.

D It turns universal indicator orange.

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23 Four oxides are listed.

- calcium oxide
- copper(II) oxide
- sulfur dioxide
- zinc oxide

Which statement about these oxides is correct?

A All of them contain oxide ions.

B Only three of them are reduced by carbon to give a metal.

C Only two of them react with aqueous NaOH to give a salt.

D Only one of them will give a colour in the flame test.

24 Which salt is insoluble in water?

A barium sulfate

B lead(II) nitrate

C magnesium chloride

D sodium carbonate

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

Some properties of the first four noble gases are shown.

noble gas	boiling point / °C	density in g / dm^3
helium	–267	0.179
neon	–246	0.900
argon	–186	1.782
krypton	–152	3.708

Which row identifies the trends in boiling point and in density as Group VIII is descended?

	boiling point / °C	density in g / dm^3
A	decreasing	increasing
B	increasing	increasing
C	decreasing	decreasing
D	increasing	decreasing

26 The table shows some physical properties of four different substances.

Which row describes the properties of a non-metallic element?

	melting point / °C	conductivity when solid	conductivity when melted
A	63	good	good
B	119	poor	poor
C	659	good	good
D	808	poor	good

27 Which properties of aluminium make it useful in the manufacture of aircraft bodies?

1 It has good electrical conductivity.

2 It is resistant to corrosion.

3 It has a low density.

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

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28 Four mixtures are listed.

1 $Cu^{2+}(aq) + Ag(s)$

2 $Zn(s) + Fe^{2+}(aq)$

3 $Cu^{2+}(aq) + Mg(s)$

4 $Cu(s) + Ag^{+}(aq)$

Which mixtures would lead to a reaction?

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

29 A blue anhydrous substance is used to test for the presence of water.

When water is added to this substance, it changes colour.

What is the anhydrous substance and what is its colour after the addition of water?

	anhydrous substance	colour after addition of water
A	cobalt(II) chloride	pink
B	cobalt(II) chloride	white
C	copper(II) sulfate	pink
D	copper(II) sulfate	white

30 Which gas is found in clean, dry air?

A carbon monoxide

B carbon dioxide

C nitrogen dioxide

D sulfur dioxide

31 Which statement describes how the C–H bonds in methane gas in the atmosphere contribute to global warming?

A They absorb thermal energy from the Sun and emit some of this energy into space.

B They absorb thermal energy from the Sun and emit all of this energy towards the Earth.

C They absorb thermal energy from the Earth and emit all of this energy towards the Earth.

D They absorb thermal energy from the Earth and emit some of this energy towards the Earth.

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32 The formulas of three hydrocarbons are listed.

1 $CH_3CH(CH_3)CH_3$

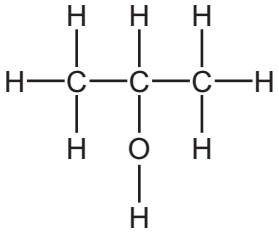
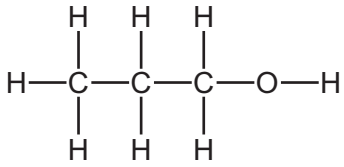
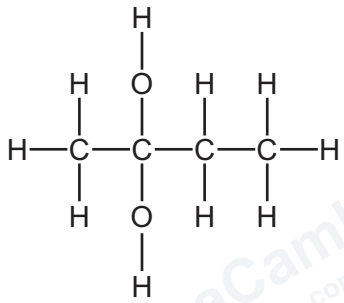
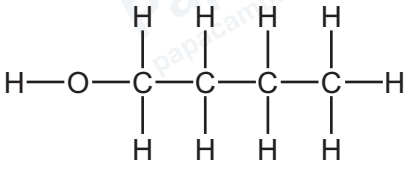
2 $CH_3CH_2CH_2CHCH_2$

3 $CH_3CH_2CH_2CH_2CH_3$

Which compounds are members of the same homologous series?

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

33 Which row gives the correct structural and displayed formula of the named organic molecule?

	name of organic molecule	**structural formula**	**displayed formula**
A	propan-2-ol	$CH_3CH_2(OH)CH_3$	
B	propan-1-ol	$CH_3CH(OH)CH_3$	
C	butan-2-ol	$CH_3C(OH)_2CH_2CH_3$	
D	butan-1-ol	$CH_3CH_2CH_2CH_2OH$	

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34 Which equation describes an addition reaction?

A $C_5H_{12} + 8O_2 \rightarrow 5CO_2 + 6H_2O$

B $C_3H_8 + Br_2 \rightarrow C_3H_7Br + HBr$

C $C_{10}H_{22} \rightarrow C_4H_8 + C_6H_{12} + H_2$

D $C_4H_8 + H_2 \rightarrow C_4H_{10}$

35 Which reaction is used to make ethanol?

A adding steam to ethene

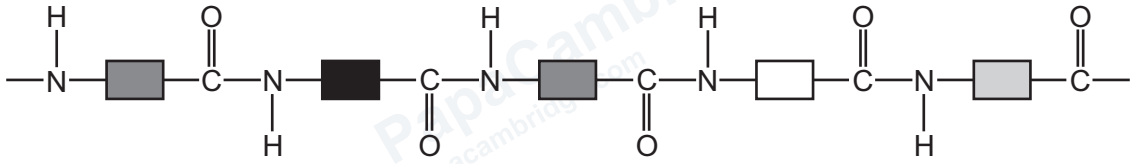
B addition polymerisation

C fractional distillation of petroleum

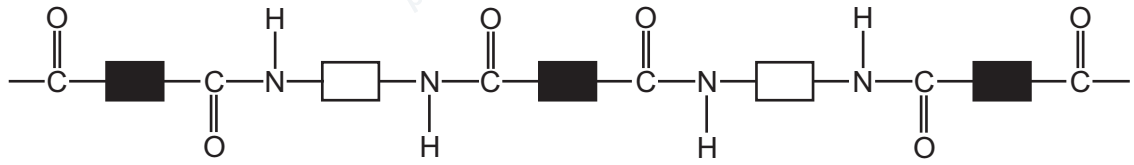
D reacting ethene with aqueous bromine

36 Which structure represents a protein?

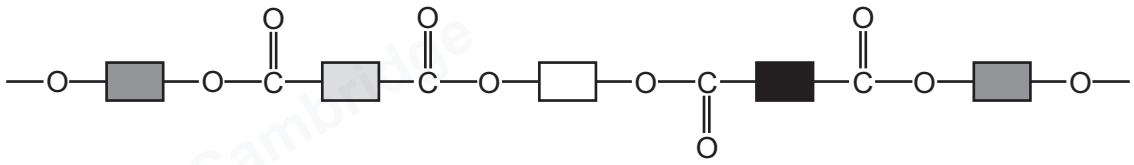
A



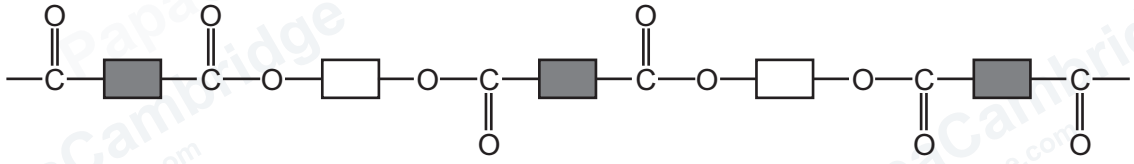
B



C

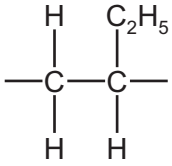


D

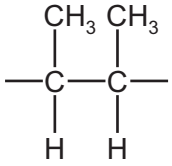


37 Which structure represents the repeat unit of the addition polymer formed from but-1-ene?

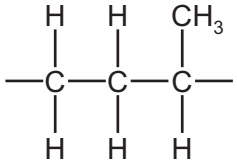
A



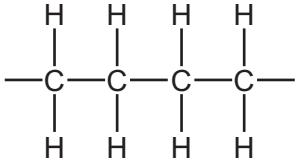
B



C



D



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38 A student measures the rate of two reactions.

In one reaction, there is a change in mass of the reactants during the reaction.

In the second reaction, there is a change in temperature during the reaction.

Which piece of apparatus would be essential in **both** experiments?

A balance

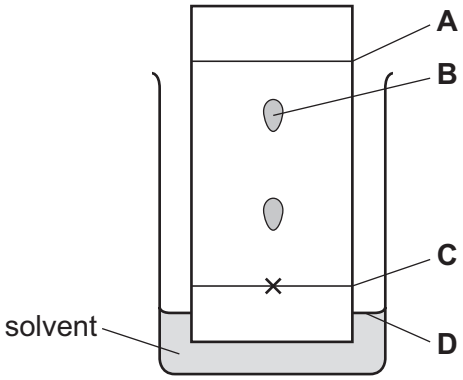
B stop-watch

C pipette

D thermometer

39 The diagram shows a chromatography experiment.

Which label shows the solvent front?



40 Which row shows the reagents that are used to test for the chloride ion and for the sulfate ion?

	chloride	sulfate
A	aqueous acidified silver nitrate	aqueous acidified barium nitrate
B	aqueous acidified barium nitrate	aluminium foil and aqueous sodium hydroxide
C	aqueous acidified silver nitrate	aluminium foil and aqueous sodium hydroxide
D	aqueous acidified barium nitrate	aqueous acidified silver nitrate

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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.).

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