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CHEMISTRY **0620/22**

Paper 2 Multiple Choice (Extended) **February/March 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)

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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 or tape.
- 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 A sample of helium gas is placed in a free-moving gas syringe.

The temperature of the helium is increased. The pressure of the helium does **not** change.

Which statement is correct?

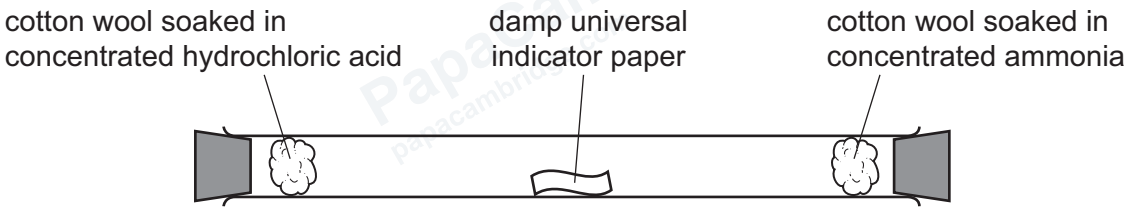
A The volume of helium decreases, and the helium atoms get closer together.

B The volume of helium decreases, and the helium atoms get further apart.

C The volume of helium increases, and the helium atoms get closer together.

D The volume of helium increases, and the helium atoms get further apart.

2 An experiment is set up as shown.



The concentrated hydrochloric acid gives off hydrogen chloride gas, HCl, which dissolves in water to form an acid.

The concentrated ammonia gives off ammonia gas which dissolves in water to form an alkali.

Which row describes and explains the first change in the universal indicator paper?

	colour of universal indicator paper	**reason**
A	blue	molecules of ammonia move more quickly than molecules of hydrogen chloride
B	red	molecules of ammonia move more quickly than molecules of hydrogen chloride
C	blue	molecules of hydrogen chloride move more quickly than molecules of ammonia
D	red	molecules of hydrogen chloride move more quickly than molecules of ammonia

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3 X^{2+} is an ion of a Group 2 element, X.

What has the highest value in the ion?

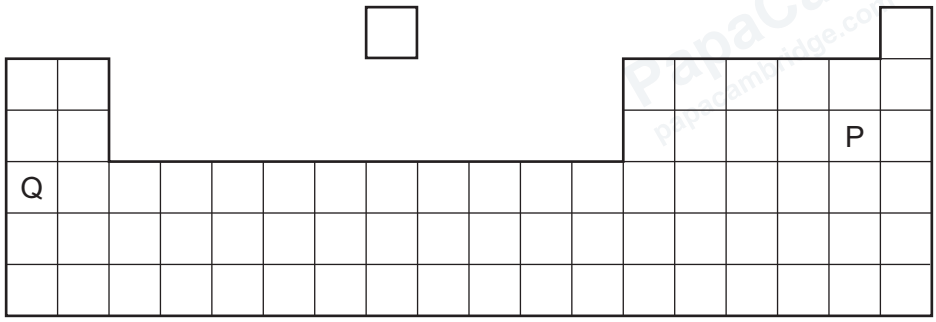
A the nucleon number

B the number of electrons

C the number of neutrons

D the proton number

4 The positions of two elements, P and Q, in the Periodic Table are shown.



P and Q react together to form a compound.

What is the formula of the compound?

A QP **B** Q_2P **C** Q_7P **D** QP_7

5 Which row describes the properties of a simple molecular compound?

	melting point / °C	**boiling point / °C**	**electrical conductivity at room temperature and pressure**
A	–39	357	good
B	3550	4830	poor
C	11	181	poor
D	97	882	good

6 How are the structures of diamond and silicon(IV) oxide similar?

A Molecules of both diamond and silicon(IV) oxide are held together by weak attractive forces.

B They both contain atoms arranged in planes held together by weak bonds.

C They both contain ions that are free to move.

D The carbon in diamond and the silicon in silicon(IV) oxide each have four covalent bonds.

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7 Solid X and solid Y are both pure substances that contain ions.

X is **not** an electrical conductor.

Y is an electrical conductor.

Which statements about X and Y are correct?

1 X is a compound. Y is an element.

2 The ions in X are held in a lattice. The ions in Y are **not** held in a lattice.

3 X contains both positive and negative ions. Y contains positive ions but no negative ions.

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

8 A sample of magnesium is burned in air.

A student calculates that 10 g of magnesium oxide should be produced.

After the reaction, the student determines the percentage yield of magnesium oxide.

Which formula is used to determine the percentage yield of magnesium oxide?

A $\frac{\text{relative atomic mass of magnesium}}{\text{relative formula mass of magnesium oxide}} \times 100$

B $\frac{\text{mass of magnesium oxide formed}}{\text{mass of magnesium used}} \times 100$

C $\frac{\text{mass of magnesium oxide formed}}{\text{mass of magnesium oxide expected}} \times 100$

D $\frac{\text{mass of pure magnesium oxide}}{\text{mass of all reaction products}} \times 100$

9 4.55 g of zinc is reacted with 50 cm^3 of 2.25 mol / dm^3 dilute hydrochloric acid.

The equation for the reaction is shown.

$$Zn + 2HCl \rightarrow ZnCl_2 + H_2$$

Which volume of hydrogen gas, at room temperature and pressure, is produced in the reaction?

A 1.35 dm^3 **B** 1.68 dm^3 **C** 2.70 dm^3 **D** 3.36 dm^3

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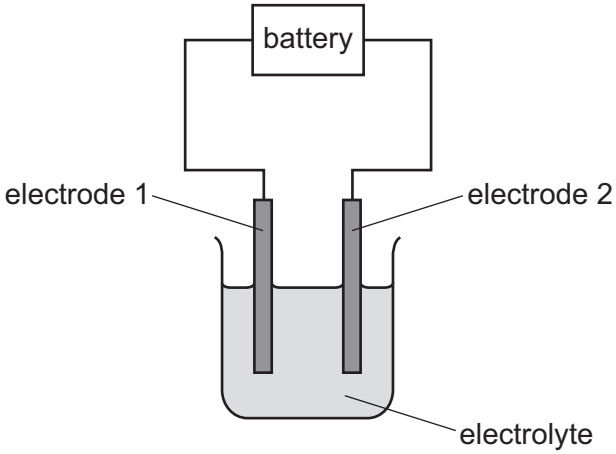
10 In the electrolysis diagram, oxidation is occurring at electrode 1 and reduction at electrode 2.



Which row shows the directions of movement of the electrons in the external circuit and of the positive ions in the electrolyte?

	direction of movement of electrons in external circuit	**direction of movement of positive ions in electrolyte**
A	1 → 2	1 → 2
B	1 → 2	2 → 1
C	2 → 1	1 → 2
D	2 → 1	2 → 1

11 Which row describes an advantage of using the hydrogen–oxygen fuel cell and an advantage of using the petrol engine?

	advantage of using the hydrogen–oxygen fuel cell	**advantage of using the petrol engine**
A	can travel a greater distance after the fuel tank has been filled	does **not** produce carbon dioxide gas which causes global warming
B	there are more petrol filling stations than hydrogen filling stations	no risk of fire or explosion if the fuel tank is damaged
C	does **not** produce carbon dioxide gas which causes global warming	can travel a greater distance after the fuel tank has been filled
D	no risk of fire or explosion if the fuel tank is damaged	there are more petrol filling stations than hydrogen filling stations

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12 Which statement describes activation energy?

A It is the maximum energy given out during a reaction.

B It is the maximum energy taken in during a reaction.

C It is the minimum energy colliding particles must have to react.

D It is the minimum energy particles must have to make bonds.

13 Hydrogen peroxide, H–O–O–H, decomposes to form water and oxygen.

$$2H_2O_2(l) \rightarrow 2H_2O(l) + O_2(g)$$

The bond energies are shown in the table. The reaction is exothermic.

bond	bond energy in kJ / mol
O–H	+460
O–O	+150
O=O	+496

What is the enthalpy change for this reaction?

A –346 kJ / mol **B** –196 kJ / mol **C** +196 kJ / mol **D** +346 kJ / mol

14 Which row shows the sources of nitrogen and of hydrogen for the Haber process?

	source of nitrogen	source of hydrogen
A	nitrates	water
B	nitrates	methane
C	air	water
D	air	methane

15 Which statement about anhydrous salts is correct?

A Anhydrous cobalt(II) chloride turns from white to blue when added to water.

B Anhydrous cobalt(II) chloride loses water on gentle heating.

C Anhydrous copper(II) sulfate reacts with water to make hydrated copper(II) sulfate.

D Anhydrous copper(II) sulfate turns from blue to white when water is added.

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16 The equation represents the reaction of iron(II) sulfate with acidified aqueous potassium manganate(VII).

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

Which ion is reduced and what is the reducing agent?

	ion reduced	reducing agent
A	Fe^{2+}	Fe^{2+}
B	Fe^{2+}	MnO_4^-
C	MnO_4^-	Fe^{2+}
D	MnO_4^-	MnO_4^-

17 Which statements about aqueous hydrochloric acid are correct?

1 It is completely dissociated in aqueous solution.

2 It turns thymolphthalein blue.

3 It acts as a strong acid in aqueous solution.

4 It produces OH^- ions.

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

18 Sulfuric acid dissociates in water in two stages.

The equations for each stage are shown.

$$H_2SO_4 \rightleftharpoons H^+ + HSO_4^-$$

$$HSO_4^- \rightleftharpoons H^+ + SO_4^{2-}$$

Which statements about these equations are correct?

1 HSO_4^- can donate and accept protons.

2 H_2SO_4 is a proton donor.

3 SO_4^{2-} is the only base.

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

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19 Which statement about amphoteric oxides is correct?

A They react with acids but **not** bases to form a salt and water.

B They react with acids and bases to form a salt and water.

C They react with acids and bases to form a salt and hydrogen.

D They react with bases but **not** acids to form a salt and water.

20 Which property of elements increases across a period of the Periodic Table?

A metallic character

B number of electron shells

C number of outer-shell electrons

D tendency to form positive ions

21 Which two compounds react together to form the insoluble salt lead(II) chloride?

	compound	**solubility in water**
1	lead(II) nitrate	yes
2	lead(II) sulfate	no
3	silver chloride	no
4	sodium chloride	yes

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

22 Which statements describe properties of transition elements?

1 They form white compounds only.

2 They are ductile.

3 They have high densities.

4 They form positive ions by gaining electrons.

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

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23 Which statement explains why aluminium has good resistance to corrosion?

A Aluminium is a highly reactive metal.

B Aluminium has an oxide layer on its surface.

C Aluminium requires heat to react.

D Aluminium is an inert metal.

24 Coating iron helps to prevent rusting.

Which coating will continue to protect the iron even when the coating is damaged?

A copper

B paint

C plastic

D zinc

25 Which statements about the substances in water from natural sources are correct?

1 Detergents contain nitrates that cause disease.

2 Sewage contains harmful microbes that cause disease.

3 All metal compounds are toxic.

4 Fertilisers contain nitrates and phosphates which damage aquatic life.

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

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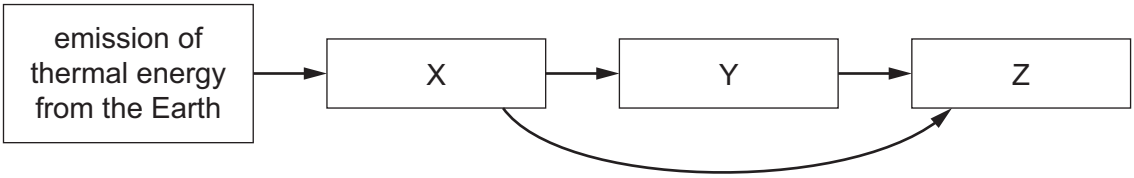
26 The diagram represents processes X and Y and their effect, Z, in increasing global warming.



Which row identifies X, Y and Z?

	X	Y	Z
A	absorption of thermal energy by greenhouse gases	emission of thermal energy to the Earth	reduced thermal energy loss to space
B	emission of thermal energy by greenhouse gases	emission of thermal energy to space	reduced thermal energy loss to space
C	absorption of thermal energy by greenhouse gases	emission of thermal energy to the Earth	increased thermal energy loss to space
D	emission of thermal energy by greenhouse gases	emission of thermal energy to space	increased thermal energy loss to space

27 Which equation describes the formation of two atmospheric pollutants that are **not** present in clean air?

A $2C_6H_{14} + 19O_2 \rightarrow 12CO_2 + 14H_2O$

B $2C_7H_{14} + 18O_2 \rightarrow 8CO_2 + 6CO + 14H_2O$

C $2C_8H_{18} + 19O_2 \rightarrow 10CO_2 + 6C + 18H_2O$

D $2C_9H_{18} + 16O_2 \rightarrow 14CO + 4C + 18H_2O$

28 Some of the fractions obtained from the fractional distillation of petroleum are used as fuels for vehicles.

Which two fractions are used as fuels for vehicles?

A bitumen fraction and gasoline fraction

B bitumen fraction and naphtha fraction

C gasoline fraction and kerosene fraction

D kerosene fraction and lubricating fraction

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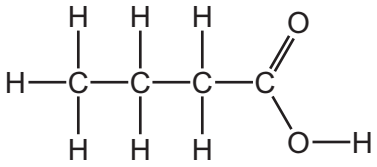
29 The displayed formula of butanoic acid is shown.



Butanoic acid reacts with ethanol to form an ester.

What is the structural formula and the empirical formula of the ester?

	structural formula	empirical formula
A	$C_3H_7COOC_2H_5$	$C_6H_{12}O_2$
B	$C_3H_7COOC_2H_5$	C_3H_6O
C	$CH_3COOC_4H_9$	$C_6H_{12}O_2$
D	$CH_3COOC_4H_9$	C_3H_6O

30 What is the structural formula of propan-1-ol?

A C_3H_7OH

B $CH_3CH_2CH_2OH$

C C_3H_8O

D $C_nH_{2n+1}OH$

31 Alkenes can undergo addition reactions with aqueous bromine, hydrogen or steam.

Which reactions of ethene need a catalyst?

1 with aqueous bromine

2 with steam

3 with hydrogen

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

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32 Which conditions are used to manufacture ethanol by fermentation?

	temperature / °C	catalyst
A	300	yeast
B	30	acid
C	300	acid
D	30	yeast

33 Which statement about an aqueous solution of ethanoic acid is correct?

A It reacts with magnesium to form water as one of the products.

B It reacts with sodium carbonate to form carbon dioxide.

C It reacts with sodium hydroxide to form hydrogen.

D It turns red litmus paper blue.

34 Which statements explain why plastics should be recycled?

1 Most do **not** decompose when they are added to landfill.

2 They pollute rivers and the ocean where they harm wildlife.

3 They can produce toxic gases when they are burned.

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

35 Which statements about the plastic PET are correct?

1 PET is a condensation polymer.

2 PET is a polyamide.

3 PET can be converted into monomers and re-polymerised.

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

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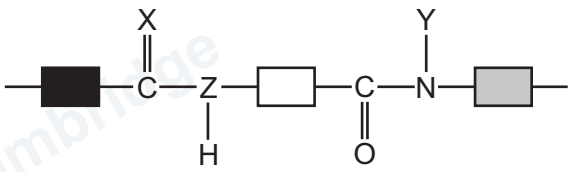
36 The diagram represents part of the structure of a protein.

Three atoms have been labelled X, Y and Z.



Which elements are X, Y and Z?

	X	Y	Z
A	carbon	hydrogen	oxygen
B	hydrogen	oxygen	nitrogen
C	oxygen	hydrogen	nitrogen
D	oxygen	hydrogen	carbon

37 Locating agents are often used in paper chromatography.

Which mixture requires a locating agent?

A a mixture of two colourless substances

B a mixture of two insoluble substances

C a mixture of two different-coloured substances with the same R_f value

D a mixture of two substances that are the same colour

38 A blue solid, Q, is soluble in water.

Which method is used to obtain pure solid Q from aqueous solution?

A chromatography

B crystallisation

C filtration

D neutralisation

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39 Two test-tubes each contain a sample of water. One test-tube contains pure water, but the other test-tube contains water and dissolved sodium chloride as an impurity.

Which tests may be used to identify the test-tube that contains pure water?

1 Measure the boiling point of each water sample.

2 Test each sample with acidified aqueous silver nitrate.

3 Test each sample with anhydrous copper(II) sulfate.

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

40 The results of some tests on dilute aqueous solution X are shown.

test	**observation**
add aqueous ammonia dropwise then add aqueous ammonia in excess	white precipitate precipitate dissolves to form colourless solution
add aqueous sodium hydroxide dropwise then add aqueous sodium hydroxide in excess	white precipitate precipitate dissolves to form colourless solution

Which cation is present in X?

A Al^{3+} **B** Ca^{2+} **C** Cr^{3+} **D** Zn^{2+}

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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 117	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 Cr 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.)

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