

CONVENT OF THE HOLY INFANT JESUS SECONDARY
Preliminary Examination in preparation for
the General Certificate of Education Ordinary Level 2025

CANDIDATE
NAME

CLASS

REGISTER
NUMBER

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CHEMISTRY

6092/01

Paper 1 Multiple Choice

29 August 2025

1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluid.

Write your name, class and register number on the Multiple Choice Answer Sheet provided.

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 separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

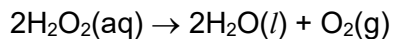
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done on the question paper.

A copy of the Periodic Table is printed on page 16.

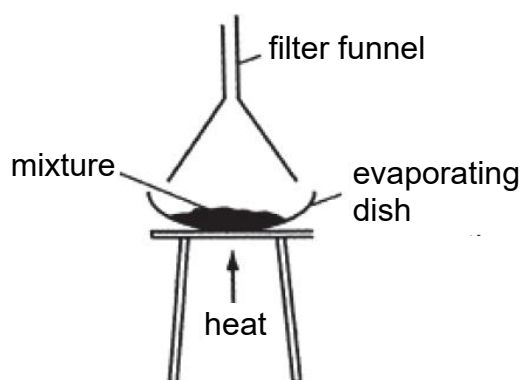
The use of an approved scientific calculator is expected, where appropriate.

- 1 An experiment is done to determine the rate of decomposition of hydrogen peroxide.



Which pieces of apparatus are needed for this experiment?

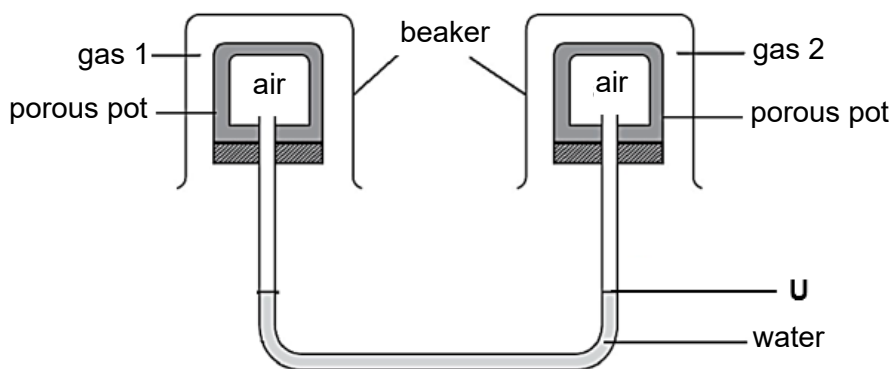
- A conical flask, gas syringe, stopwatch
 - B conical flask, gas syringe, thermometer
 - C conical flask, stopwatch, thermometer
 - D gas syringe, stopwatch, thermometer
- 2 The diagram shows a set-up used to separate two substances in a mixture.



Which mixtures can be separated using this set-up?

- A ammonium chloride and iodine
- B ammonium chloride and sodium chloride
- C copper(II) sulfate and sodium carbonate
- D lead(II) chloride and potassium chloride

- 3 The apparatus shown in the diagram was set up.



Which row correctly shows the pair of gases that will cause the water level at **U** to rise?

	gas 1	gas 2
A	carbon dioxide	nitrogen
B	methane	sulfur dioxide
C	nitrogen	carbon monoxide
D	sulfur dioxide	methane

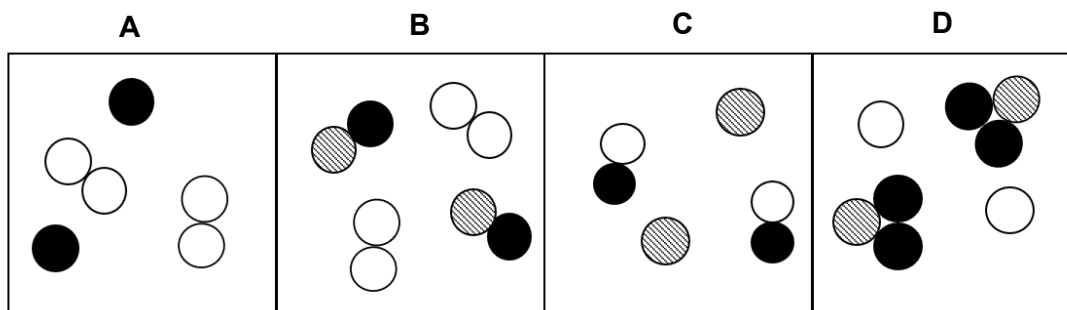
- 4 An atom of one isotope of chlorine is represented by the symbol ^{37}Cl .

Particle R has one more neutron, two more protons and one more electron than this isotope of chlorine.

Which symbol represents R?

- A** $^{38}\text{Cl}^+$ **B** $^{38}\text{Cl}^-$ **C** ^{39}K **D** $^{40}\text{K}^+$

- 5 Which diagram best represents a mixture of neon and hydrogen bromide?



- 6 Elements X and Y react to form an ionic compound of formula XY_2 .

Which row correctly shows the electronic configurations of atoms X and Y?

	atom X	atom Y
A	2, 1	2, 5
B	2, 4	2, 6
C	2, 8, 1	2, 8, 6
D	2, 8, 8, 2	2, 8, 7

- 7 Which compound contains an element that does **not** achieve the electronic configuration 2,8?

A Al_2O_3 **B** CF_4 **C** CO_2 **D** H_2O

- 8 Which particles are responsible for the conduction of electricity through metals?

A electrons only **B** electrons and positive ions
C negative and positive ions **D** positive ions only

- 9 When heated, 4 moles of compound Z produced 2 moles of oxygen gas and 4 moles of chlorine gas as the only products.

What is likely to be the molecular formula of compound Z?

A ClO_2 **B** Cl_2O_4
C Cl_2O **D** Cl_4O_2

- 10 Hydrated sodium carbonate crystals have the formula $Na_2CO_3 \cdot 10H_2O$ in which one mole of sodium carbonate is combined with 10 moles of water.

What is the percentage by mass of oxygen in hydrated sodium carbonate crystals?

[Ar: Na, 23; C, 12; O, 16; H, 1]

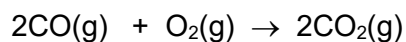
A $\frac{10 \times 16}{124} \times 100$

B $\frac{10 \times 16}{286} \times 100$

C $\frac{13 \times 16}{124} \times 100$

D $\frac{13 \times 16}{286} \times 100$

- 11 Carbon monoxide and oxygen gas react to form carbon dioxide according to the equation shown.



20 cm³ of carbon monoxide is reacted with 20 cm³ of oxygen gas to form carbon dioxide, at room temperature and pressure.

What are the volumes of gases remaining, at room temperature and pressure, at the end of the reaction?

	carbon monoxide	oxygen gas	carbon dioxide
A	0 cm ³	0 cm ³	20 cm ³
B	0 cm ³	10 cm ³	40 cm ³
C	0 cm ³	10 cm ³	20 cm ³
D	10 cm ³	0 cm ³	30 cm ³

- 12 The empirical formula of an oxide of element X is X₂O₅.

106.5g of X₂O₅ contains 60g of oxygen.

What is the identity of X?

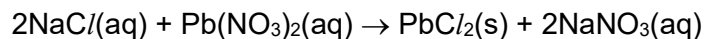
- A** $^{31}_{15}\text{P}$
- B** $^{40}_{20}\text{Ca}$
- C** $^{70}_{31}\text{Ga}$
- D** $^{175}_{71}\text{Lu}$

- 13 What volume of water must be added to dilute 100 cm³ of 8.0 mol/dm³ hydrochloric acid to a concentration of 2.0 mol/dm³?

- A** 200 cm³
- B** 300 cm³
- C** 400 cm³
- D** 500 cm³

[Turn over

- 14** Aqueous sodium chloride and aqueous lead(II) nitrate react according to the equation shown.



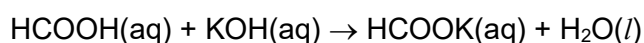
20 cm³ of 2 mol/dm³ aqueous sodium chloride is reacted with excess aqueous lead(II) nitrate.

3.34 g of lead(II) chloride precipitate is formed.

What is the percentage yield for the reaction?

- | | | | |
|----------|-----|----------|-----|
| A | 6% | B | 12% |
| C | 30% | D | 60% |

- 15** Dilute methanoic acid reacts with aqueous potassium hydroxide as shown.



What is the ionic equation for this reaction?

- A** $\text{COOH}^- (\text{aq}) + \text{K}^+ (\text{aq}) \rightarrow \text{HCOOK} (\text{aq})$
- B** $\text{H}^+ (\text{aq}) + \text{OH}^- (\text{aq}) \rightarrow \text{H}_2\text{O} (\text{l})$
- C** $\text{HCOO}^- (\text{aq}) + \text{K}^+ (\text{aq}) \rightarrow \text{HCOOK} (\text{aq})$
- D** $\text{HCOOH} (\text{aq}) + \text{K}^+ (\text{aq}) \rightarrow \text{HCOOK} (\text{aq})$

- 16** Zinc oxide was added separately to dilute solutions of an acid and an alkali.

What row gives the correct observations?

	acid	alkali
A	no reaction	no reaction
B	no reaction	salt formed
C	salt formed	no reaction
D	salt formed	salt formed

- 17** Different solids were added to separate portions of warm dilute sulfuric acid.

Which row shows the solid with the correct result?

	solid	result
A	ammonium chloride	gas evolved that turns damp red litmus paper blue
B	copper	gas evolved that 'pops' with a lighted splint
C	magnesium oxide	solid dissolves to form a colourless solution
D	zinc carbonate	gas evolved that relights a glowing splint

18 Some statements about two strong acids, HX and H₂Y, of the same concentration are given.

- 1 H₂Y has a lower pH than HX.
- 2 The rate of production of carbon dioxide is faster for H₂Y than HX when equal volumes of both acids are reacted with sodium carbonate.
- 3 More hydrogen gas is produced for HX than H₂Y when equal volumes of both acids are reacted with excess magnesium.

Which statements are correct?

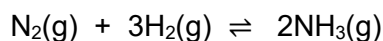
- A** 1 and 2 only
B 1 and 3 only
C 2 and 3 only
D 1, 2 and 3

19 Different salts can be made by adding different reagents together.

Which row shows the correct reagents used to safely make the salt?

	salt	reagents
A	calcium nitrate	calcium chloride and nitric acid
B	copper(II) sulfate	copper(II) nitrate and sodium sulfate
C	magnesium carbonate	magnesium nitrate and potassium carbonate
D	sodium chloride	sodium and hydrochloric acid

20 Ammonia is manufactured by the Haber Process.



Which statement is **not** correct?

- A** Finely divided iron is used as a catalyst.
B Hydrogen is obtained from the cracking of petroleum.
C Nitrogen is obtained from the fractional distillation of crude oil.
D The rate of reaction increases if a higher temperature is used.

[Turn over

- 21 An aqueous solution containing two salts is found.

A student tests the mixture to determine which ions are present. The results are shown.

test number	test	observations
1	add dilute nitric acid then	no observable change
	add aqueous silver nitrate	a white precipitate is formed
2	add aqueous sodium hydroxide drop by drop till excess, then	a white precipitate is formed, insoluble in excess sodium hydroxide
	warm the mixture	gas evolved turns damp red litmus paper blue
3	to the solution from Test 2, add aluminium foil, then warm the mixture.	gas evolved turns damp red litmus paper blue

What is present in the mixture?

- A aluminium chloride and ammonium nitrate
 B aluminium nitrate and ammonium iodide
 C ammonium chloride and calcium nitrate
 D ammonium nitrate and calcium iodide
- 22 Which reaction does **not** involve oxidation and/or reduction?

- A $C + O_2 \rightarrow CO_2$
 B $2NH_3 + 3CuO \rightarrow N_2 + 3Cu + 3H_2O$
 C $K_2CO_3 + 2HNO_3 \rightarrow CO_2 + 2KNO_3 + H_2O$
 D $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$

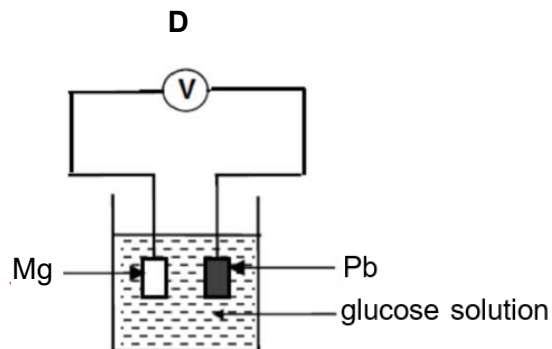
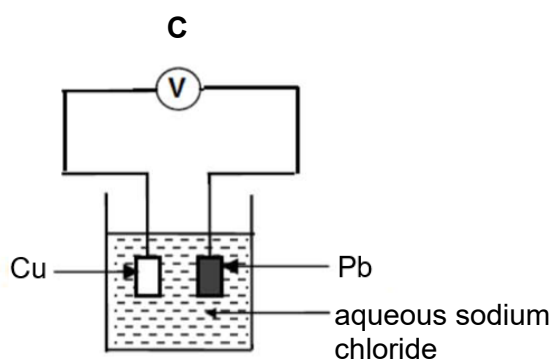
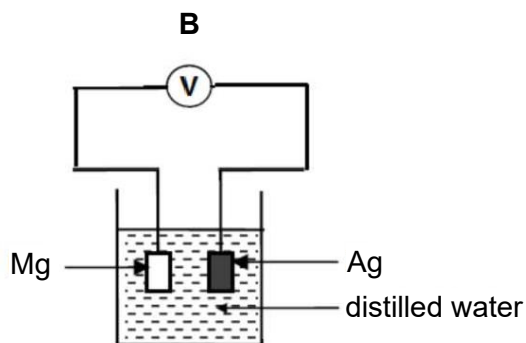
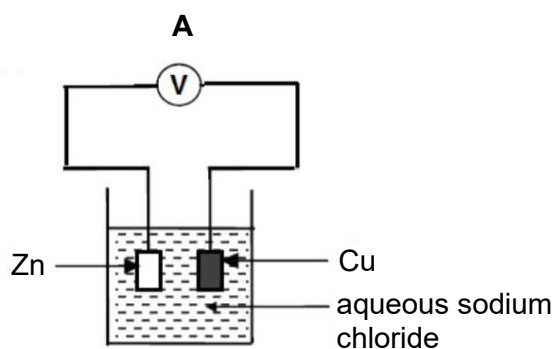
- 23 Aqueous chlorine was added separately to aqueous potassium iodide and acidified potassium manganate(VII).

Which row correctly shows the role of aqueous chlorine, and the colour changes of both potassium iodide and potassium manganate(VII)?

	role of aqueous chlorine	colour change	
		potassium iodide	potassium manganate(VII)
A	oxidising agent	brown to colourless	purple to colourless
B	oxidising agent	colourless to brown	remains purple
C	reducing agent	brown to colourless	purple to colourless
D	reducing agent	colourless to brown	remains purple

- 24** The diagrams show four simple cells.

Which simple cell will produce the greatest reading on the voltmeter?



- 25** In an electrolysis experiment, the same amount of charge deposited 54.0 g of silver and 6.375 g of vanadium.

What is the charge on the vanadium ion?

- | | |
|-------------|-------------|
| A 1+ | B 2+ |
| C 3+ | D 4+ |

- 26** Elements X, Y and Z are in the same period of the Periodic Table.

Some statements about these elements are given:

- 1 X has a greater tendency to gain electrons compared to Y.
- 2 Z forms a basic oxide, ZO.
- 3 Y does not conduct electricity

In which order, from left to right, do the elements appear in the Periodic Table?

- | | |
|--------------------|--------------------|
| A X → Y → Z | B Y → Z → X |
| C Z → X → Y | D Z → Y → X |

[Turn over

27 Five statements about common trends in physical and chemical properties are given.

- 1 Melting point increases down the group.
- 2 Melting point decreases down the group.
- 3 Reactivity decreases down the group.
- 4 Reactivity increases down the group.

Which statements are correct for Group 1 and Group 17 elements?

	Group 1	Group 17
A	1, 3	2, 4
B	1, 4	2, 3
C	2, 3	1, 4
D	2, 4	1, 3

28 Some of the reactions of four metals, W, X, Y and Z, are described.

Only metals W, Y and Z react with dilute sulfuric acid to produce hydrogen gas.

Only the oxides of W and X are reduced by heating with hydrogen.

Y displaces Z from an aqueous solution of the sulfate of Z.

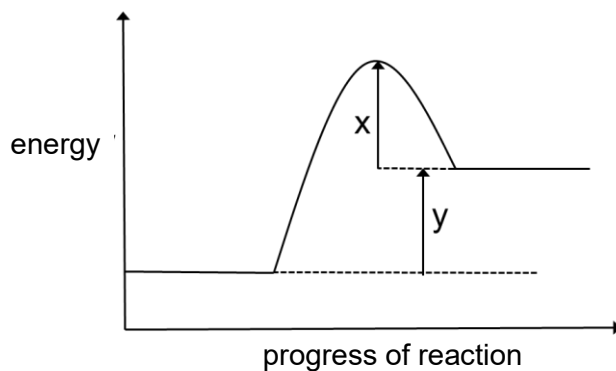
Which row correctly shows the reactivity of W, X, Y and Z?

	most reactive  least reactive			
A	W	X	Y	Z
B	W	Y	Z	X
C	Y	Z	W	X
D	Z	Y	W	X

29 Which statement describes what happens when hydrogen and oxygen are used in a fuel cell?

- A** Electricity is generated directly.
- B** Electrical energy is converted to chemical energy.
- C** Hydrogen is burned to form steam.
- D** Hydrogen reacts to form a hydrocarbon fuel.

- 30 The energy profile diagram for a reaction is shown.



Which statement is correct?

- A The energy absorbed in breaking bonds is labelled x.
 - B The reaction could be between sodium hydroxide and dilute nitric acid.
 - C The temperature of the reaction mixture decreases during the reaction.
 - D The value of y decreases in the presence of a catalyst.
- 31 The position of metal Z in the reactivity series is shown.

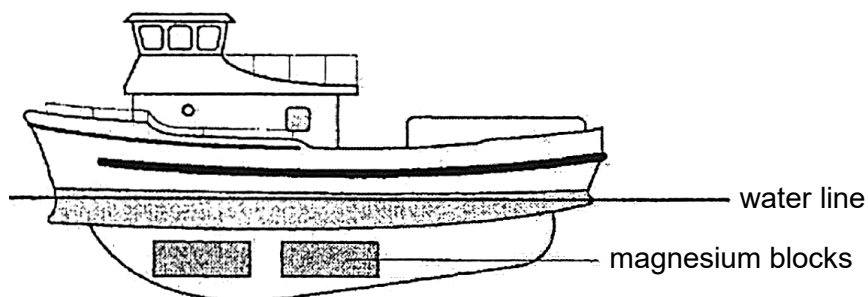
K, Na, Mg, Zn, Fe, Z, Cu

Which statement about metal Z is correct?

- A It can be displaced from solutions containing its ions by copper.
- B It can be extracted from its ore by electrolysis.
- C It cannot be extracted from its ore by reduction with carbon.
- D It forms a carbonate that takes a longer time to decompose as compared to the carbonate of magnesium.

- 32** Most boats are built with a hull that consists of a high percentage of iron.

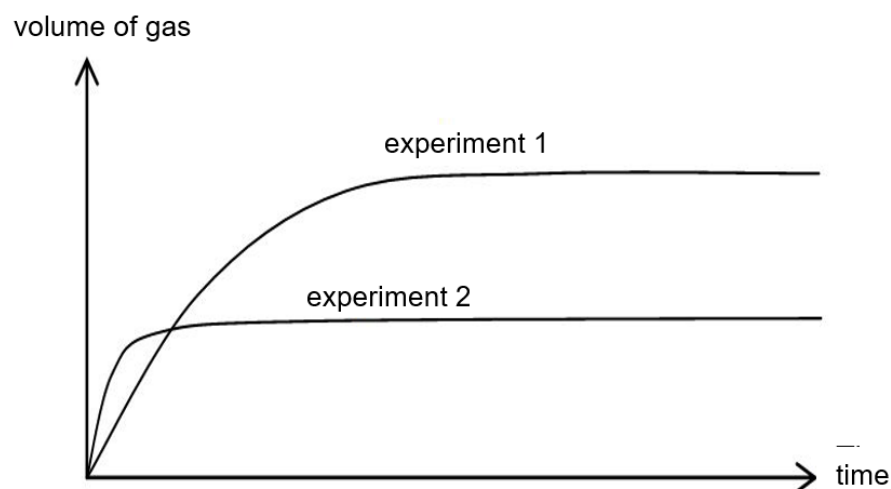
Magnesium blocks are often attached to the hull below the water line to prevent the iron from rusting.



Which statement explains why magnesium prevents the iron from rusting?

- A** Magnesium forms an alloy with iron.
 - B** Magnesium gains electrons more readily than iron.
 - C** Magnesium loses electrons more readily than iron.
 - D** Magnesium reacts with oxygen to form a protective coating over the iron.
- 33** Which statement about the fractional distillation of crude oil is correct?
- A** At each level of the fractionating column, only one compound is collected.
 - B** The fraction at the top of the column is the least flammable.
 - C** The fraction collected at the bottom of the column has the highest viscosity.
 - D** The higher up the fractionating column, the higher the temperature.

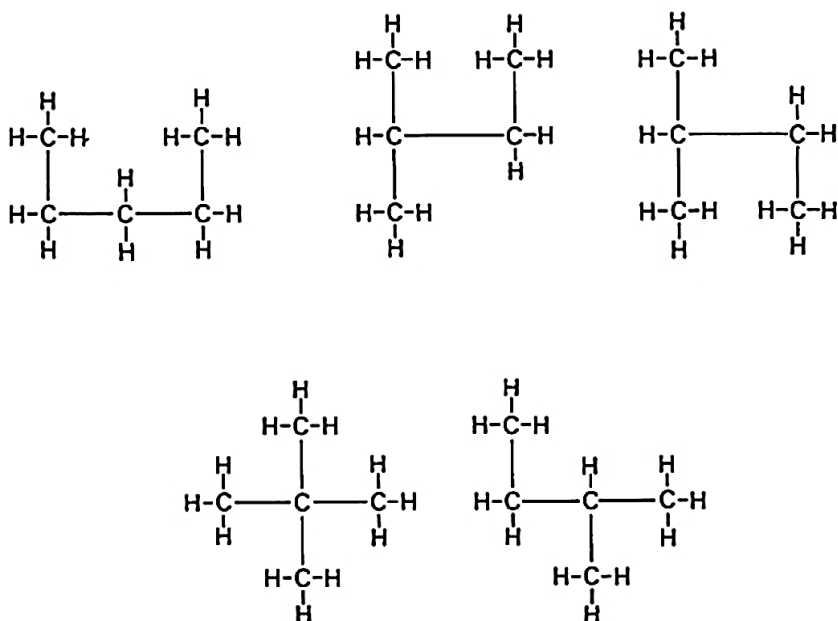
- 34** In experiment 1, excess powdered magnesium carbonate was reacted with dilute nitric acid at 30°C. The total volume of gas produced is measured. The results for experiment 1 are plotted on the graph.



The experiment is repeated with a different set of conditions. The results for experiment 2 are plotted on the graph.

Which row shows the correct set of conditions that will give the graph for experiments 1 and 2?

	experiment 1	experiment 2
A	50 cm ³ of 0.10 mol/dm ³ dilute nitric acid at 30°C	25 cm ³ of 0.10 mol/dm ³ dilute nitric acid at 30°C
B	50 cm ³ of 0.10 mol/dm ³ dilute nitric acid at 30°C	25 cm ³ of 0.10 mol/dm ³ dilute nitric acid at 50°C
C	50 cm ³ of 0.05 mol/dm ³ dilute nitric acid at 30°C	50 cm ³ of 0.10 mol/dm ³ dilute nitric acid at 30°C
D	50 cm ³ of 0.05 mol/dm ³ dilute nitric acid at 30°C	25 cm ³ of 0.10 mol/dm ³ dilute nitric acid at 50°C



A	2	B	3
C	4	D	5

$$1 \text{ mole of } \text{C}_8\text{H}_{18} \xrightarrow{\text{process X}} 1 \text{ mole of ethane} + 2 \text{ moles of compound Y}$$

	process X	compound Y
A	cracking	propane
B	cracking	propene
C	distillation	propane
D	distillation	propene

- 37** An ester of molecular formula $C_4H_8O_2$ was produced by the reaction of an alcohol with a carboxylic acid.

	alcohol	carboxylic acid
1	methanol	propanoic acid
2	ethanol	ethanoic acid
3	propanol	methanoic acid

Which pair(s) of reactants could be the alcohol and the carboxylic acid?

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

- 38** An alcohol, X, was fully oxidised to a carboxylic acid.

Neutralisation of the acid with magnesium carbonate gave a salt of formula $(\text{CH}_3\text{CO}_2)_2\text{Mg}$.

What was alcohol X?

- A** CH₃OH **B** CH₃CH₂OH
C CH₃CH₂CH₂OH **D** CH₃CH₂CH₂CH₂OH

- 39** An unsaturated fatty acid has structural formula $\text{C}_{17}\text{H}_{31}\text{CO}_2\text{H}$.

How many carbon-carbon double bonds are present in one molecule of the unsaturated fatty acid?

- | | | | |
|----------|---|----------|---|
| A | 1 | B | 2 |
| C | 3 | D | 4 |

- 40** Which atmospheric pollutants, emitted by internal combustion engines, are reacted together to convert them to less harmful products?

- A** carbon monoxide and nitrogen dioxide
- B** carbon monoxide and unburned hydrocarbons
- C** nitrogen dioxide and sulfur dioxide
- D** sulfur dioxide and unburned hydrocarbons

End of Paper

The Periodic Table of Elements

Group																	
1	2											13	14	15	16	17	18
Key proton (atomic) number atomic symbol name relative atomic mass							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	3	4	5	6	7	8	9	10	11	12	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 —

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
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 —

actinoids

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

The Avogadro constant, $L = 6.02 \times 10^{23} \text{ mol}^{-1}$.