



MINISTRY OF EDUCATION, SINGAPORE
in collaboration with
CAMBRIDGE ASSESSMENT INTERNATIONAL EDUCATION
General Certificate of Education Ordinary Level

CHEMISTRY

6092/01

Paper 1 Multiple Choice

For examination from 2024

SPECIMEN PAPER

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, Centre number and index number on the Answer Sheet in the spaces provided unless this has been done for you.

DO NOT WRITE ON ANY BARCODES.

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 in this booklet.

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

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

This document consists of **16** printed pages.



Singapore Examinations and Assessment Board



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- 1 Aqueous sodium hydroxide is neutralised by dilute hydrochloric acid in a titration.

25.0 cm³ of aqueous sodium hydroxide is measured into a conical flask using a ...1... and a few drops of methyl orange indicator is added to the solution.

The dilute hydrochloric acid is added to the conical flask using a ...2... .

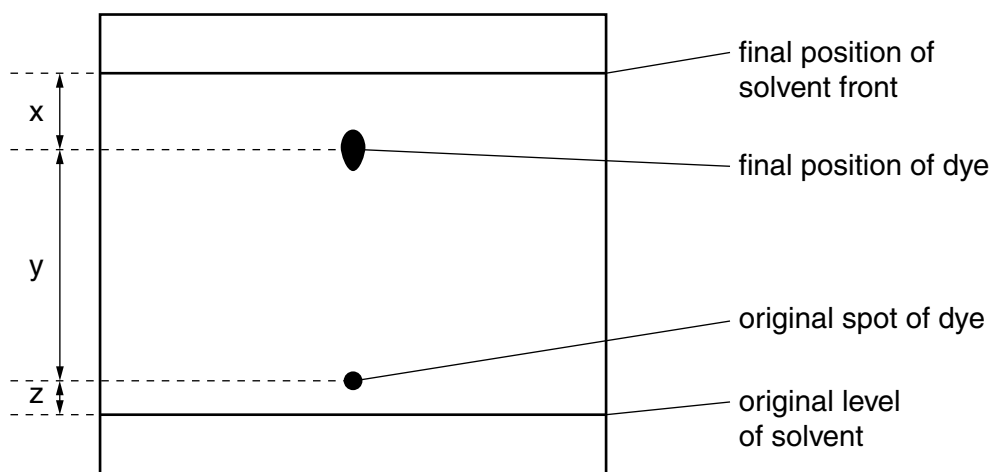
The end-point is reached when the methyl orange indicator turns ...3... .

Which row completes gaps 1, 2 and 3?

	1	2	3
A	burette	pipette	red
B	burette	pipette	orange
C	pipette	burette	orange
D	pipette	burette	red

- 2 The diagram shows the chromatogram obtained by analysis of a single dye.

Three measurements are shown.



How is the R_f value of the dye calculated?

- A** $\frac{x}{x+y}$ **B** $\frac{y}{x+y}$ **C** $\frac{x}{x+y+z}$ **D** $\frac{y}{x+y+z}$

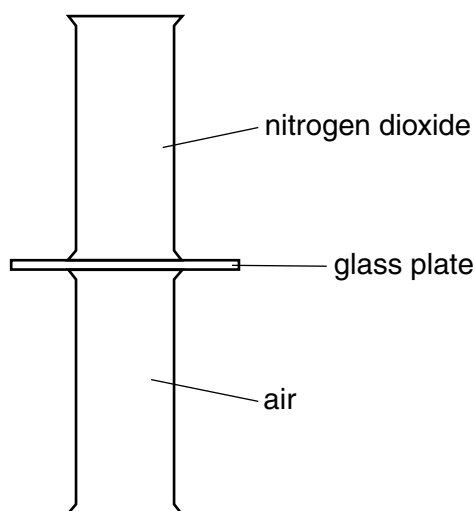
3 Hexane and water are immiscible liquids.

Which method could be used to separate a mixture of hexane and water and how is the purity of the separated hexane checked?

	method of separation	purity check
A	filtration	find the boiling point
B	filtration	by sublimation
C	use a separating funnel	find the boiling point
D	use a separating funnel	by sublimation

4 Nitrogen dioxide is a dark brown gas and is more dense than air.

A gas jar containing nitrogen dioxide is sealed with a glass plate and is then inverted on top of a gas jar containing air.



The glass plate is removed.

Which row correctly describes the colours inside the gas jars after a long period of time? The gases are at room temperature and pressure.

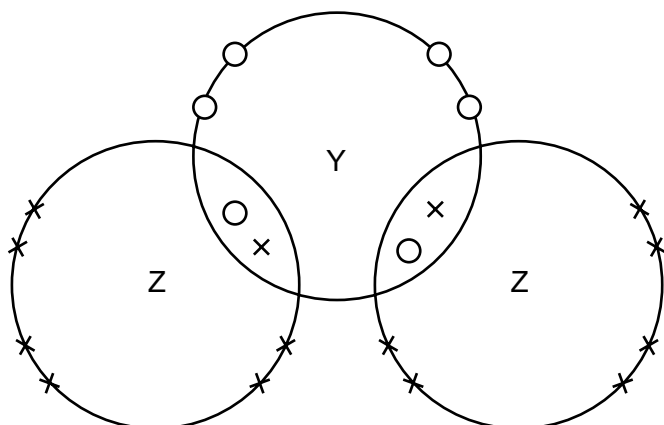
	upper gas jar	lower gas jar
A	brown	brown
B	colourless	dark brown
C	dark brown	light brown
D	light brown	dark brown

- 5 The compound $C_2H_3Br_3$ contains only the ^{12}C isotope of carbon and the 1H isotope of hydrogen.

The two stable isotopes of bromine are ^{79}Br and ^{81}Br .

Using these two isotopes of bromine, how many different relative molecular masses are possible for $C_2H_3Br_3$?

- A 2 B 3 C 4 D 5
- 6 Which statement explains why sodium chloride, $NaCl$, has a lower melting point than magnesium oxide, MgO ?
- A Sodium chloride is covalent but magnesium oxide is ionic.
 B Sodium is more reactive than magnesium.
 C The attraction between Na^+ and Cl^- is weaker than that between Mg^{2+} and O^{2-} .
 D The melting point of sodium is lower than that of magnesium.
- 7 The outer shell electrons in a molecule, YZ_2 , are shown.



key

○ electrons of atom Y

× electrons of atom Z

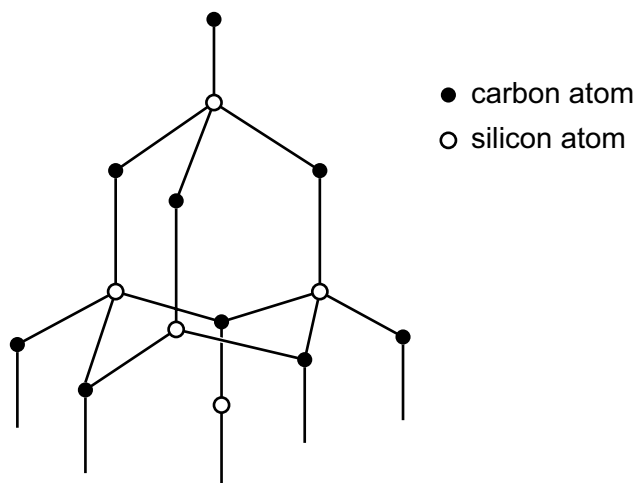
Using the Periodic Table, how many protons are in atom Y?

- A 6 B 8 C 12 D 18
- 8 Substance J conducts electricity when in the solid state.
 J reacts with hydrochloric acid.
 Which substance could J be?
- A copper
 B copper(II) oxide
 C sodium chloride
 D zinc

9 Element X is a metal. Using only this information, what can be deduced about element X?

- A It has a low melting point.
- B It is a conductor of heat.
- C It is less dense than water.
- D It is very reactive.

10 The diagram shows the structure of silicon carbide, SiC.



Which set of properties does silicon carbide have?

	physical state	when strongly heated in oxygen
A	soft solid	combusts, giving a solid residue only
B	soft solid	combusts, leaving no solid residue
C	hard solid	combusts, giving a solid residue and a colourless gas
D	hard solid	combusts, giving a solid residue only

11 Which statement about graphite is correct?

- A It conducts electricity because graphite has ions which are free to move.
- B It has an ionic lattice.
- C It has the same structure as diamond.
- D Its structure contains hexagonal rings of carbon atoms.

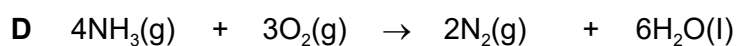
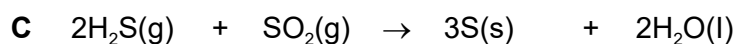
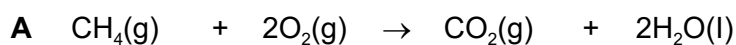
12 What is the relative molecular mass of propanoic acid?

- A 58
- B 60
- C 74
- D 88

13 Which compound contains the highest percentage mass of oxygen?

	compound	relative formula mass
A	Al_2O_3	102
B	Co_3O_4	241
C	CuO	80
D	$KMnO_4$	158

14 In which reaction does the smallest percentage change in volume occur?



15 In a titration, 25.0cm^3 of aqueous potassium hydroxide, KOH , is neutralised by 21.50cm^3 of 0.100mol/dm^3 sulfuric acid, H_2SO_4 .

What is the concentration of the aqueous potassium hydroxide?

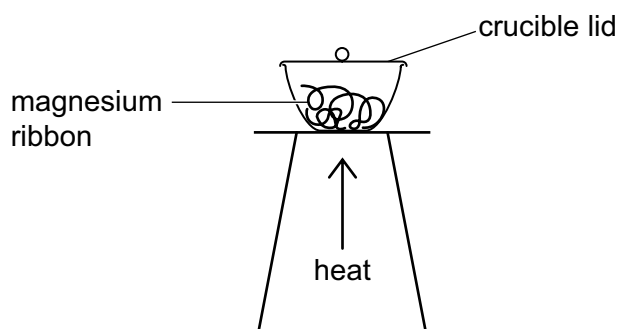
A 0.002mol/dm^3

B 0.004mol/dm^3

C 0.086mol/dm^3

D 0.172mol/dm^3

16 When 4.8g of magnesium is heated in a crucible, 5.9g of magnesium oxide is formed.



What is the percentage yield of magnesium oxide?

A 53%

B 74%

C 80%

D 81%

17 Which ionic equation correctly represents the neutralisation of aqueous sodium hydroxide with dilute nitric acid?

- A $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}$
 B $\text{Na}^+ + \text{NO}_3^- \rightarrow \text{NaNO}_3$
 C $\text{Na}^+ + \text{HNO}_3 \rightarrow \text{NaNO}_3 + \text{H}^+$
 D $\text{NaOH} + \text{H}^+ \rightarrow \text{Na}^+ + \text{H}_2\text{O}$

18 Which pair of aqueous solutions produce a precipitate when they are mixed?

- A barium nitrate and silver nitrate
 B sodium chloride and barium nitrate
 C sodium nitrate and barium chloride
 D sodium sulfate and barium chloride

19 Which equation shows the most suitable reaction for making lead(II) sulfate?

- A $\text{Pb} + \text{H}_2\text{SO}_4 \rightarrow \text{PbSO}_4 + \text{H}_2$
 B $\text{PbCO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{PbSO}_4 + \text{CO}_2 + \text{H}_2\text{O}$
 C $\text{Pb}(\text{NO}_3)_2 + \text{H}_2\text{SO}_4 \rightarrow \text{PbSO}_4 + 2\text{HNO}_3$
 D $\text{PbCl}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{PbSO}_4 + 2\text{HCl}$

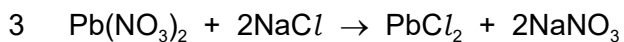
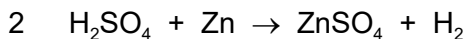
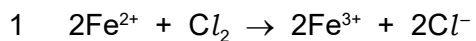
20 The table shows the results of tests carried out on compound X.

test	result
dilute hydrochloric acid added	gas given off which gave a white precipitate with limewater
warm with aqueous sodium hydroxide	gas given off which turned damp red litmus blue

What is compound X?

- A ammonium carbonate
 B ammonium nitrate
 C calcium carbonate
 D calcium nitrate

21 Which are redox reactions?



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

22 Which statement about the electrolysis of concentrated aqueous sodium chloride using inert electrodes is correct?

A Chlorine is released at the cathode.

B Oxygen is released at the cathode.

C Sodium is released at the cathode.

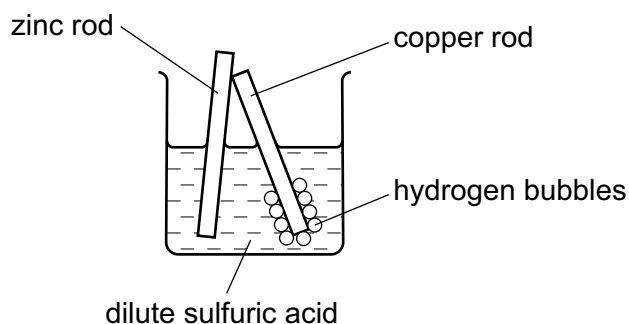
D The pH of the electrolyte increases.

23 In which electrolysis experiment would there be no change in the concentration of the solution?

	electrolyte	electrodes
A	aqueous copper(II) sulfate	carbon
B	aqueous copper(II) sulfate	copper
C	concentrated aqueous potassium chloride	carbon
D	dilute sulfuric acid	platinum

- 24 In an experiment, rods of copper and zinc are dipped into dilute sulfuric acid. The top of each rod is touching.

Hydrogen bubbles collect around the copper rod.



Which statement about the experiment is correct?

- A** Copper reacts with the acid.
- B** Electrons flow from zinc to copper.
- C** The zinc becomes coated with copper.
- D** The zinc is less reactive than copper.
- 25 The element with proton number 12 has similar chemical properties to the element with which proton number?
- A** 2 **B** 11 **C** 20 **D** 24
- 26 Element Z has the following properties.
- It has a high melting point.
 - Its presence can lower the activation energy of a reaction.

What type of element is Z?

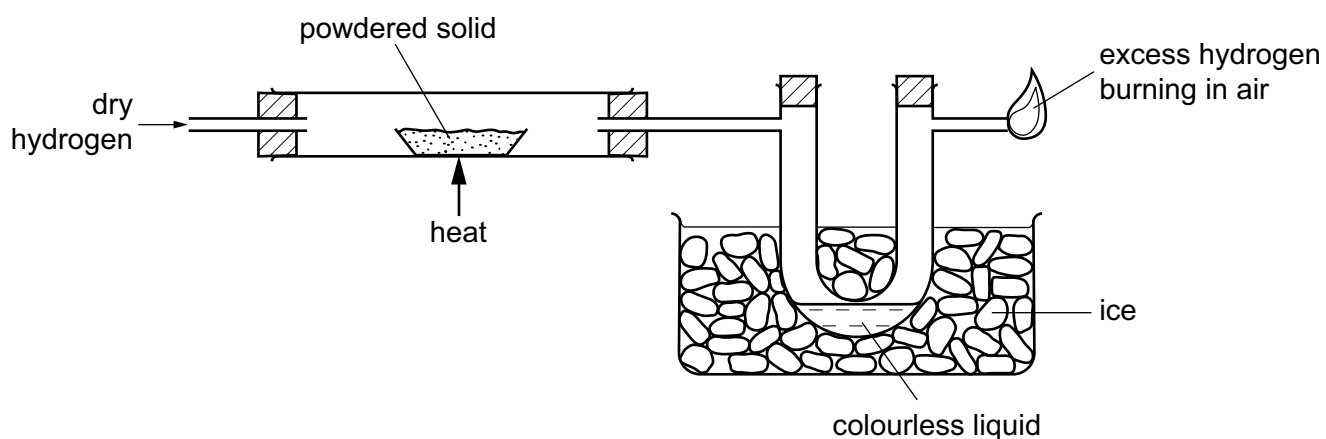
- A** a halogen
- B** an alkali metal
- C** a noble gas
- D** a transition metal

27 Chromium is between zinc and iron in the reactivity series.

Which element reduces the oxide of chromium?

- A carbon
- B copper
- C iron
- D lead

28 Dry hydrogen gas is passed over a heated powdered solid and then through a cooled U-tube before the excess of hydrogen is burned in air.

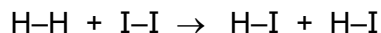


A colourless liquid collects in the U-tube.

What could the powdered solid be?

- A calcium oxide
- B copper(II) oxide
- C magnesium
- D zinc oxide

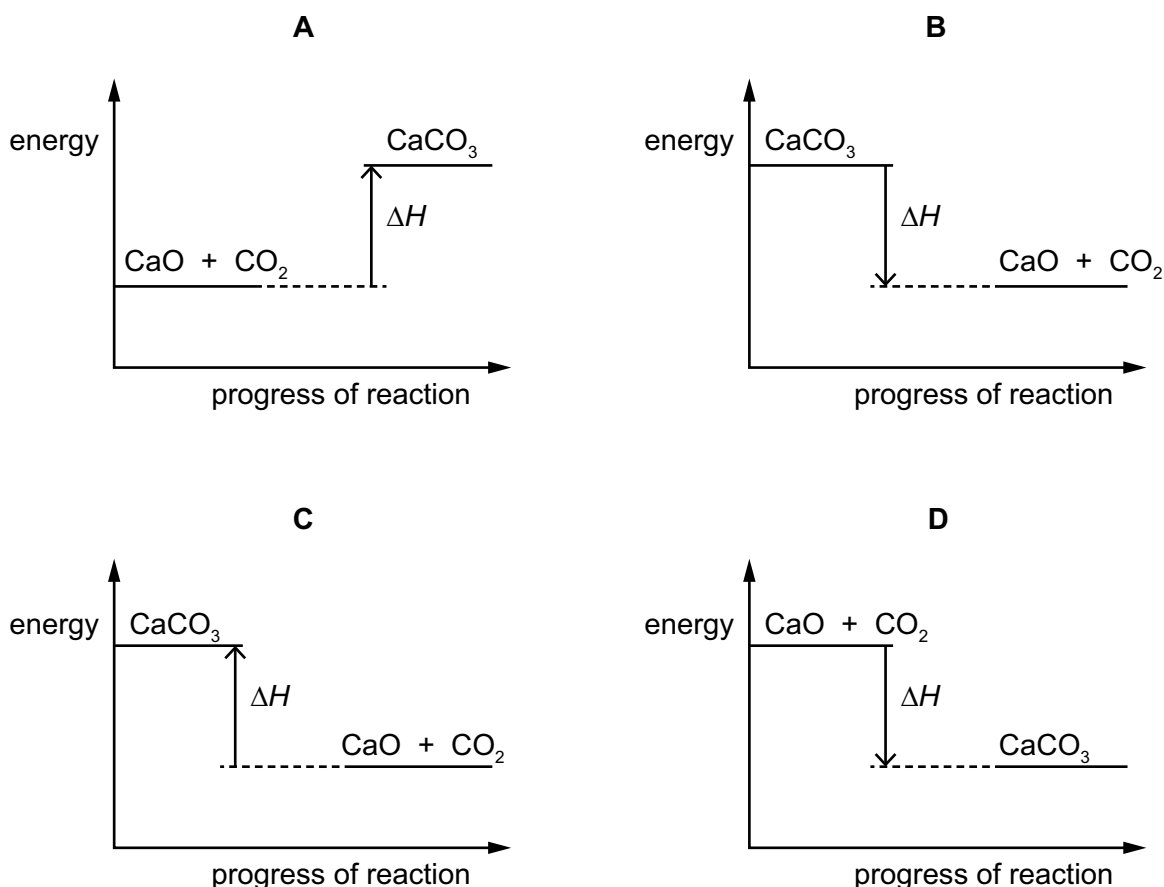
- 29 The formation of hydrogen iodide from hydrogen and iodine is an endothermic reaction.



What may be deduced from this information?

- A The number of bonds broken is greater than the number of bonds formed.
 B The formation of H-I bonds absorbs energy.
 C The products possess less energy than the reactants.
 D The total energy change in bond formation is less than that in bond breaking.
- 30 Calcium carbonate decomposes endothermically into calcium oxide and carbon dioxide.

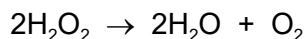
Which energy profile diagram correctly shows the reaction of calcium oxide and carbon dioxide to form calcium carbonate?



- 31 In which reaction is pressure **least** likely to affect the rate of reaction?

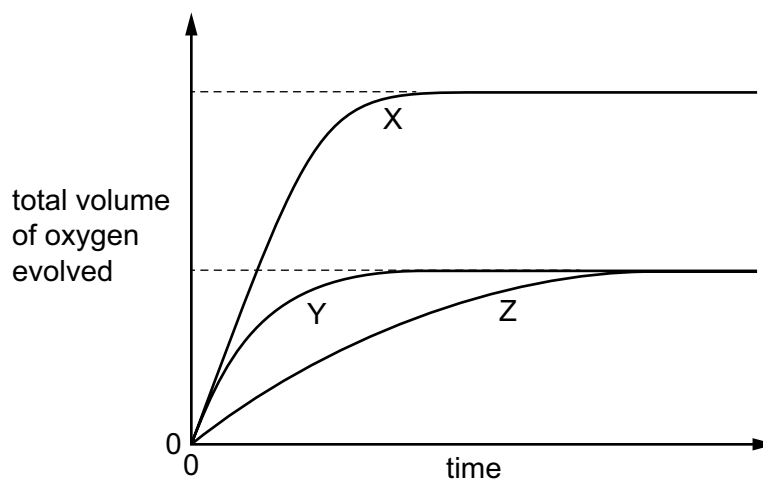
- A $\text{C(s)} + \text{CO}_2(\text{g}) \rightarrow 2\text{CO(g)}$
 B $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$
 C $\text{NaOH(aq)} + \text{HCl(aq)} \rightarrow \text{NaCl(aq)} + \text{H}_2\text{O(l)}$
 D $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{SO}_3(\text{g})$

32 Aqueous hydrogen peroxide is catalytically decomposed by manganese(IV) oxide.



To study the effect of the concentration of the solution on the rate of reaction, the total volume of oxygen evolved is recorded against time. Three experiments are performed using a fixed mass of catalyst but with the following volumes and concentrations of hydrogen peroxide solution:

- solution 1 50 cm³ of 2.0 mol/dm³ hydrogen peroxide
 solution 2 100 cm³ of 1.0 mol/dm³ hydrogen peroxide
 solution 3 100 cm³ of 2.0 mol/dm³ hydrogen peroxide



On the graph above, which of the curves X, Y and Z relate to the solutions 1, 2 and 3?

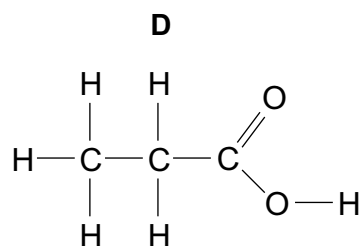
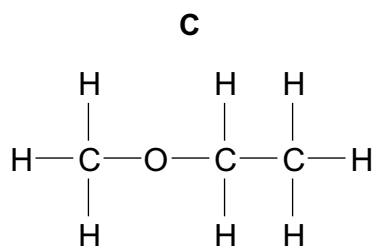
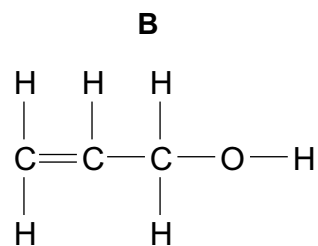
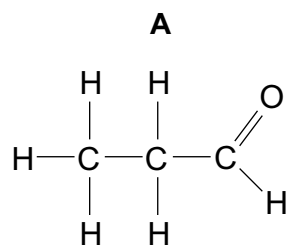
	1	2	3
A	X	Y	Z
B	X	Z	Y
C	Z	X	Y
D	Y	Z	X

33 Octane is a hydrocarbon found in petrol.

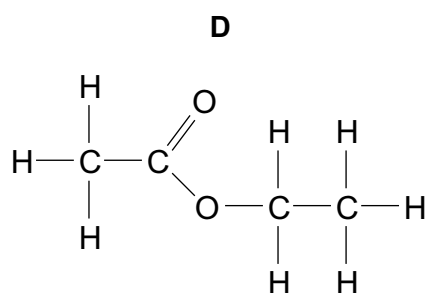
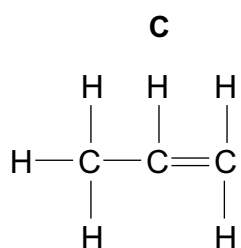
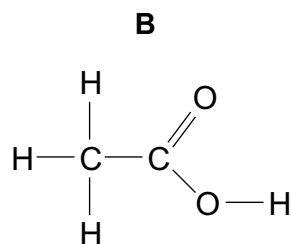
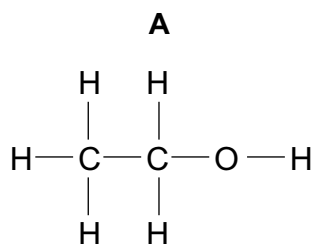
Which statement about octane is correct?

- A** It can be polymerised.
B It decolourises aqueous bromine.
C It has a lower boiling point than methane.
D It reacts with chlorine by substitution.

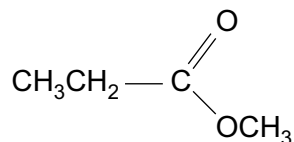
34 Which compound is an isomer of propanol?



35 Which compound reacts with sodium carbonate to produce carbon dioxide?

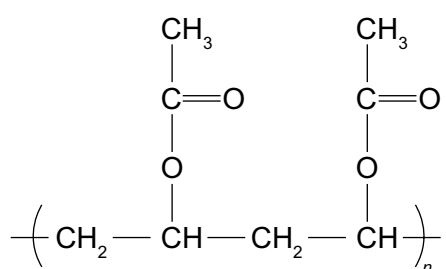


36 Which acid and alcohol react together to form the compound shown?



- A ethanoic acid and ethanol
- B ethanoic acid and methanol
- C propanoic acid and ethanol
- D propanoic acid and methanol

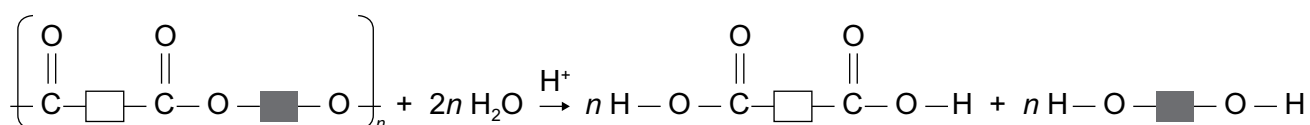
37 The diagram shows the partial structure of a polymer.



Which of the following could be used to make this polymer?

- A $\text{CH}_3\text{CO}_2\text{CH}=\text{CH}_2$
- B $\text{CH}_3\text{CO}_2\text{H}$ and $\text{HOCH}_2\text{CH}_2\text{OH}$
- C $\text{CH}_3\text{COCH}=\text{CH}_2$
- D $\text{CH}_3\text{CO}_2\text{CH}_3$ and $\text{HOCH}_2\text{CH}_2\text{OH}$

38 The equation for one method of recycling a polymer is shown.

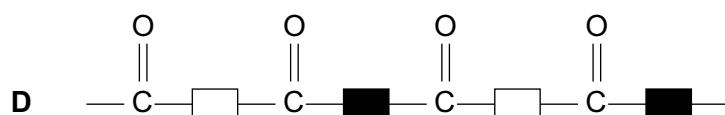
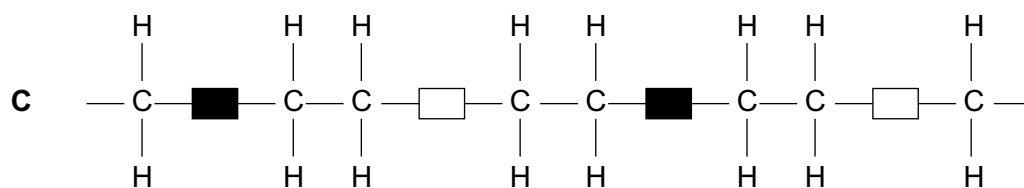
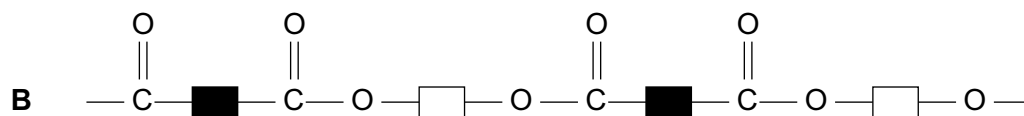
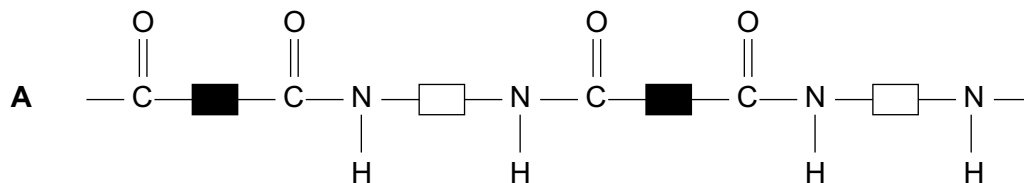


Which statements are correct?

- 1 The polymer could be nylon.
- 2 The reaction is catalysed hydrolysis.
- 3 If \blacksquare is CH_2CH_2 , the alcohol product has $M_r = 62$.

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

39 Which diagram represents the structure of *Terylene*?



40 Which compound is used in flue gas desulfurisation?

- A calcium carbonate
- B carbon monoxide
- C copper(II) oxide
- D potassium manganate(VII)

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The Periodic Table of Elements

Group																												
1	2	Key												13	14	15	16	17	18									
		1	proton (atomic) number atomic symbol name relative atomic mass																									
		1	H hydrogen 1																									
3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18													
Li lithium 7	Be beryllium 9	B boron 11	C carbon 12	N nitrogen 14	O oxygen 16	F fluorine 19	Ne neon 20	Na sodium 23	Mg magnesium 24	Al aluminium 27	Si silicon 28	P phosphorus 31	S sulfur 32	Cl chlorine 35.5	Ar argon 40													
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36											
K potassium 39	Ca calcium 40	Sc scandium 45	Ti titanium 48	V vanadium 51	Cr chromium 52	Mn manganese 55	Fe iron 56	Co cobalt 59	Ni nickel 59	Cu copper 64	Zn zinc 65	Ga gallium 70	Ge germanium 73	As arsenic 75	Se selenium 79	Br bromine 80	Kr krypton 84											
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54											
Rb rubidium 85	Sr strontium 88	Y yttrium 89	Zr zirconium 91	Nb niobium 93	Mo molybdenum 96	Tc technetium —	Ru ruthenium 101	Rh rhodium 103	Pd palladium 106	Ag silver 108	Cd cadmium 112	In indium 115	Sn tin 119	Sb antimony 122	Te tellurium 128	I iodine 127	Xe xenon 131											
55	56	57–71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86											
Cs caesium 133	Ba barium 137	lanthanoids	Hf hafnium 178	Ta tantalum 181	W tungsten 184	Re rhenium 186	Os osmium 190	Ir iridium 192	Pt platinum 195	Au gold 197	Hg mercury 201	Tl thallium 204	Pb lead 207	Bi bismuth 209	Po polonium —	At astatine —	Rn radon —											
87	88	89–103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118											
Fr francium —	Ra radium —	actinoids	Rf rutherfordium —	Db dubnium —	Sg seaborgium —	Bh bohrium —	Hs hassium —	Mt meitnerium —	Ds darmstadtium —	Rg roentgenium —	Cn copernicium —	Nh nihonium —	Fl flerovium —	Mc moscovium —	Lv livermorium —	Ts tennessine —	Og oganesson —											

lanthanoids	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
	La lanthanum 139	Ce cerium 140	Pr praseodymium 141	Nd neodymium 144	Pm promethium —	Sm samarium 150	Eu europium 152	Gd gadolinium 157	Tb terbium 159	Dy dysprosium 163	Ho holmium 165	Er erbium 167	Tm thulium 169	Yb ytterbium 173	Lu lutetium 175
actinoids	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103
	Ac actinium —	Th thorium 232	Pa protactinium 231	U uranium 238	Np neptunium —	Pu plutonium —	Am americium —	Cm curium —	Bk berkelium —	Cf californium —	Es einsteinium —	Fm fermium —	Md mendelevium —	No nobelium —	Lr lawrencium —

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).
The Avogadro constant, $L = 6.02 \times 10^{23} \text{ mol}^{-1}$.