



康 柏 中 学
COMPASSVALE SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2022
CHEMISTRY 6092/01
Paper 1 Multiple Choice
Secondary Four Express

Name: _____

Duration: 1 h

Index No: _____

Date: 31 August 2022

Class: _____

Marks: _____ /40

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, index number and class on the Answer Sheet in the spaces 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 in this booklet.

A copy of the Periodic Table is printed on page 15.

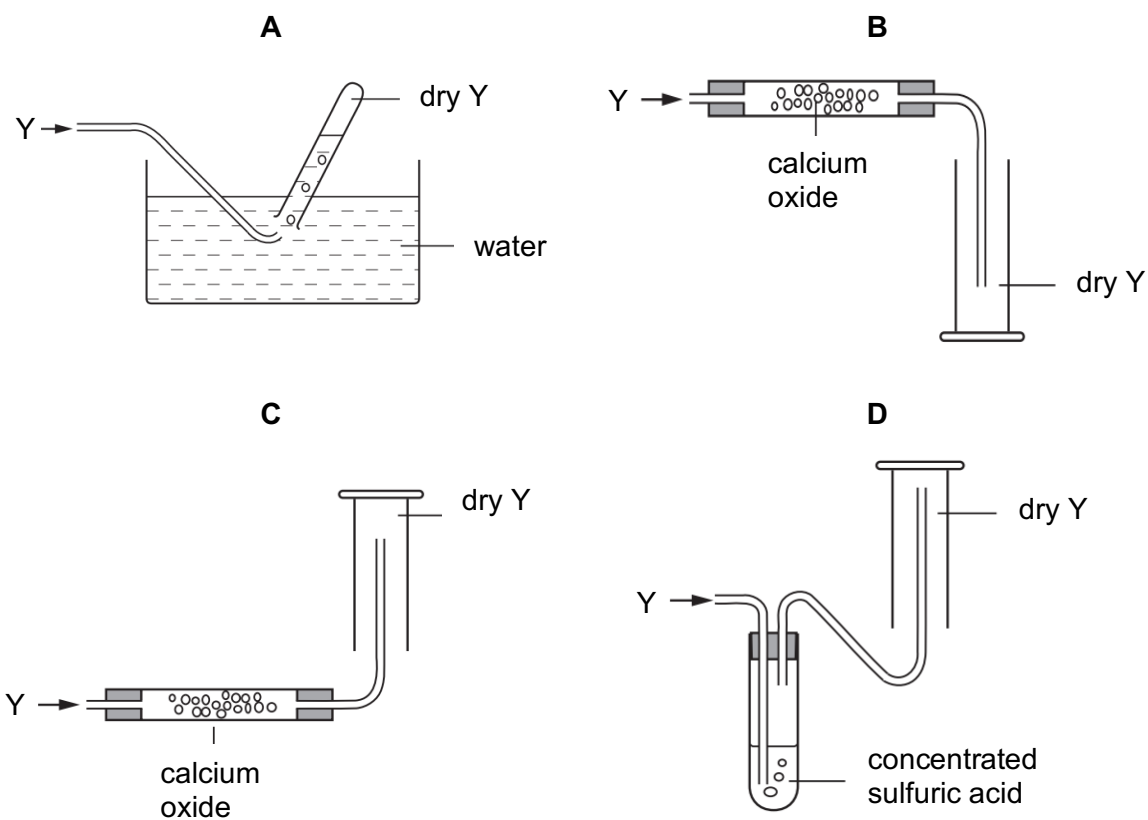
The use of an approved scientific calculator is expected, where appropriate.

- 1 The concentration of aqueous sodium carbonate can be found through an experiment involving a reaction with nitric acid of known concentration.

Which apparatus are needed for the experiment?

- A burette, measuring cylinder, gas syringe
B burette, pipette, conical flask
C burette, pipette, stopwatch
D electronic balance, measuring cylinder, gas syringe
- 2 Gas Y is a water-soluble, acidic gas which is less dense than air.

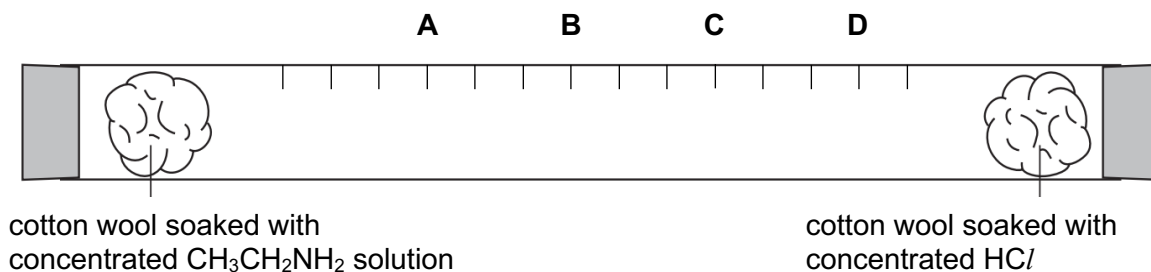
Which method is used to collect a dry sample of gas Y?



- 3 Ethylamine, $\text{CH}_3\text{CH}_2\text{NH}_2$ ($M_r = 45$), reacts with hydrogen chloride gas, HCl ($M_r = 36.5$) to form a white solid, ethylammonium chloride.

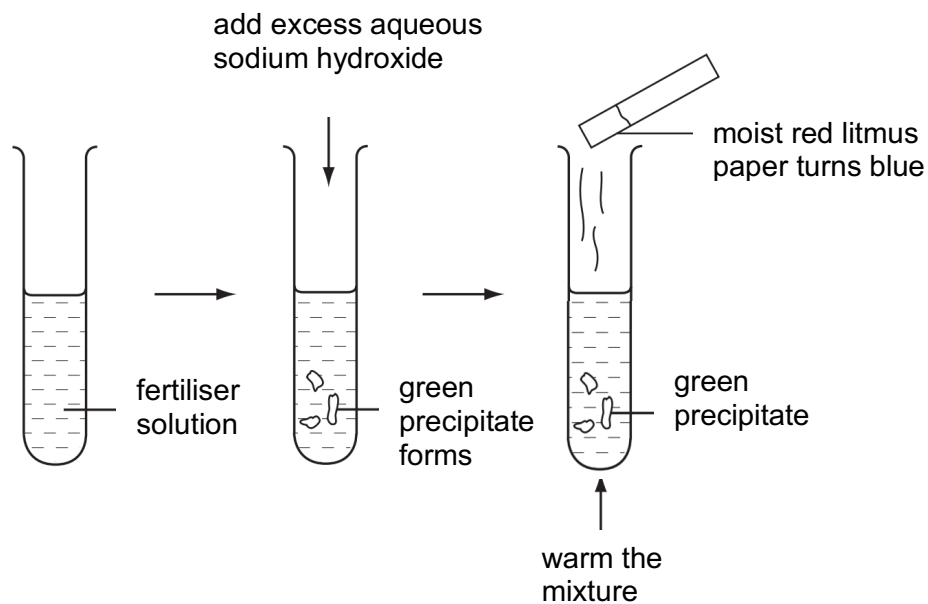
In an experiment, the following apparatus is set up.

Where will the white solid form?



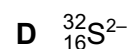
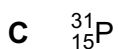
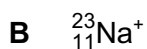
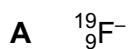
- 4 Which statement about kinetic particle theory is correct?
- A Energy is taken in when a liquid changes into solid state.
 - B Iodine particles are further apart in vapour state than in solid state.
 - C Particles have stronger attractive forces in gaseous state than in liquid state.
 - D When water boils, its particles lose kinetic energy.
- 5 When two elements react together, a compound is formed.
- Which statement is correct?
- A Equal masses of the elements must be used.
 - B The compound formed can be easily separated into its elements.
 - C The compound formed will have a fixed melting point.
 - D The compound shows similar chemical properties to its constituent elements.

- 6 A solution of fertiliser was tested as shown.



Which ions are present in this fertiliser?

- A Fe^{2+} and NH_4^+
 B Fe^{2+} and NO_3^-
 C Fe^{2+} and SO_4^{2-}
 D NH_4^+ and NO_3^-
- 7 Which particle has the same number of neutrons and electrons?



- 8 Unnilpentium is an artificial element. One of its isotopes is ${}^{262}_{105}\text{Unp}$.

Which statement is correct?

- A ${}^{262}_{105}\text{Unp}$ has a nucleon number of 105.
 B Isotopes of unnilpentium have different chemical properties.
 C The atom ${}^{262}_{106}\text{Y}$ is an isotope of ${}^{262}_{105}\text{Unp}$.
 D The atom ${}^{260}_{105}\text{X}$ is an isotope of ${}^{262}_{105}\text{Unp}$.

- 9 Ammonium nitrate, NH_4NO_3 , is a white crystalline salt that is commonly used in agriculture as a high-nitrogen fertilizer.

Three statements about ammonium nitrate are given.

statement 1 Forces of attraction between oppositely charged ions is present in ammonium nitrate.

statement 2 Molten ammonium nitrate can conduct electricity as there are delocalised electrons.

statement 3 There is covalent bonding in ammonium nitrate.

Which statements are correct?

- A 1 only B 2 and 3 only C 2 only D 1 and 3 only
- 10 Which molecule has only six electrons used for bonding?

- A C_2H_4 B C_2H_6 C H_2O D PCl_3

- 11 Elements P and Q form an ionic compound P_2Q .

In which group of the Periodic Table is P found and how is the bond between P and Q formed?

	group in which P is found	how the bond between P and Q is formed
A	I	Q atom gains two electrons from two P atoms
B	II	Q atom gains two electrons from one P atom
C	VI	P and Q shares two electrons
D	VI	P atom gains two electrons from two Q atoms

- 12 The formula of china clay (aluminium silicate) was shown in an old book as $\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$.

It is shown in a modern book as $\text{Al}_2(\text{OH})_x\text{Si}_2\text{O}_y$.

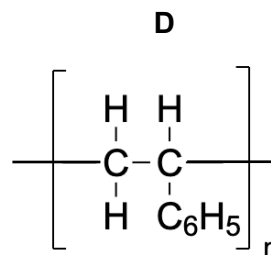
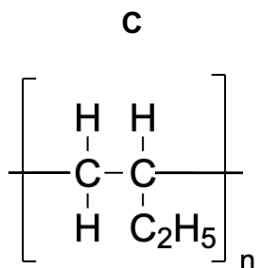
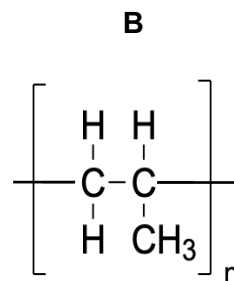
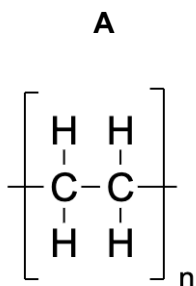
What are the values of x and y?

	x	y
A	2	4
B	2	5
C	4	3
D	4	5

- 13** One mole of each of the following compounds is burnt in excess oxygen.

Which compound would produce four moles of carbon dioxide and four moles of steam only?

- A** C_4H_{10}
B $\text{C}_4\text{H}_9\text{OH}$
C $\text{C}_2\text{H}_5\text{CO}_2\text{H}$
D $\text{CH}_3\text{CH}_2\text{CO}_2\text{CH}_3$
- 14** Which polymer has an empirical formula that is different from the rest?



- 15** A washing powder contains sodium hydrogencarbonate, NaHCO_3 ($M_r = 84$). In a titration, a solution containing 1.00 g of washing powder requires 7.15 cm^3 of 0.1 mol/dm^3 sulfuric acid for complete reaction.



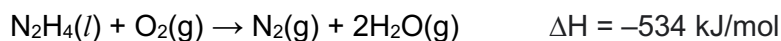
Given that sodium hydrogencarbonate is the only ingredient that reacts with the acid, what is the percentage purity of sodium hydrogencarbonate in the washing powder?

- A** 3.0% **B** 6.0% **C** 12.0% **D** 24.0%
- 16** The pH of an aqueous solution of hydrochloric acid is 3.

What will be the pH of the solution after adding 15 g of sodium chloride?

- A** 2 **B** 3 **C** 7 **D** 9

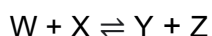
- 17 Hydrazine, N_2H_4 , is used as a rocket fuel since it reacts with oxygen to form gases that are environmentally friendly.



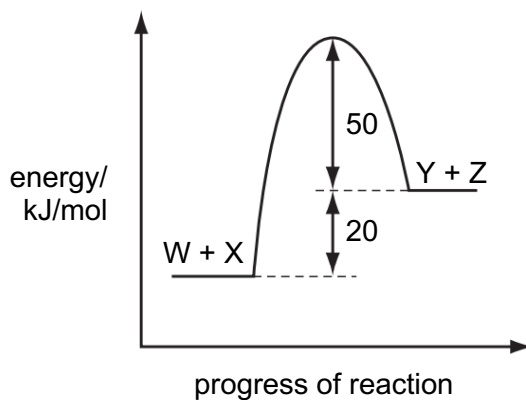
Despite its use as a rocket fuel, hydrazine does not burn readily in oxygen.

Which statement explains why hydrazine does **not** burn readily?

- A Hydrazine is a liquid.
 - B The activation energy is too high.
 - C The $\text{N}\equiv\text{N}$ bond is very strong.
 - D The reaction is exothermic.
- 18 W and X reacts to form Y and Z in a reversible reaction.



The energy profile diagram for this reaction is shown.



Which statements are correct?

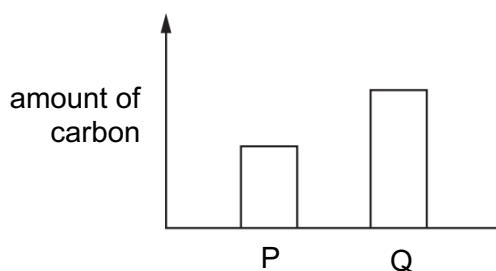
- 1 The enthalpy change for the backward reaction is +20 kJ/mol.
 - 2 The forward reaction is endothermic.
 - 3 The activation energy for the forward reaction is +70 kJ/mol.
- A 1 and 2 B 1 and 3 C 1, 2 and 3 D 2 and 3

- 19** An alloy reacts with dilute nitric acid to evolve a gas which extinguishes a lighted splint with a 'pop' sound. A red-brown solid residue remains, which turns into a black solid when heated in air.

Which two metals are present in this alloy?

- A** iron and copper
- B** iron and aluminium
- C** silver and zinc
- D** silver and copper

- 20** The diagram compares the amount of carbon in two steels, P and Q.



Which row correctly compares the strength and brittleness of P and Q?

	strength	brittleness
A	$Q > P$	$Q > P$
B	$Q > P$	$P > Q$
C	$P > Q$	$Q > P$
D	$P > Q$	$P > Q$

- 21** Aluminum, caesium and zinc are three commonly used metals.

Caesium, Cs, is a metal that is above aluminum in the reactivity series.

Which row correctly shows the extraction of the three metals?

	aluminium	zinc	caesium
A	electrolysing $AlCl_3(aq)$	heating ZnO with coke	electrolysing $CsCl(aq)$
B	electrolysing $AlCl_3(aq)$	electrolysing $ZnCl_2(aq)$	electrolysing $CsCl(l)$
C	electrolysing $Al_2O_3(l)$	heating ZnO with coke	electrolysing $CsCl(l)$
D	heating Al_2O_3 with coke	electrolysing $ZnCl_2(aq)$	heating Cs_2O with coke

- 22** Old steel pipes corrode quickly in a damp atmosphere but aluminum cans do not. Which statement correctly explains this?

A Aluminium cannot form variable oxidation states but iron can.
B Aluminium has a lower density than iron.
C Aluminium is above iron in the reactivity series.
D Aluminium is protected by its oxide layer.

- 23** Which process does **not** involve either oxidation or reduction?

A formation of ammonium chloride from ammonia and hydrochloric acid
B formation of nitrogen monoxide from ammonia
C formation of sulfuric acid from sulfur
D formation of zinc from zinc sulfide

- 24** Aqueous potassium iodide is used as a test reagent.

When it is added to an aqueous solution of compound Z, the colour of the test reagent changes from1..... . This colour change shows that Z is2..... .

Which words correctly complete the sentence?

	1	2
A	brown to colourless	oxidised
B	brown to colourless	reduced
C	colourless to brown	oxidised
D	colourless to brown	reduced

- 25** River water in a chalky agricultural area is suspected to contain Ca^{2+} , Mg^{2+} , CO_3^{2-} , Cl^- and NO_3^- ions. During an investigation, the water is treated by adding a calculated quantity of calcium hydroxide.

What could be precipitated upon the addition of calcium hydroxide?

A CaCl_2 **B** CaCO_3 **C** MgCl_2 **D** $\text{Mg}(\text{NO}_3)_2$

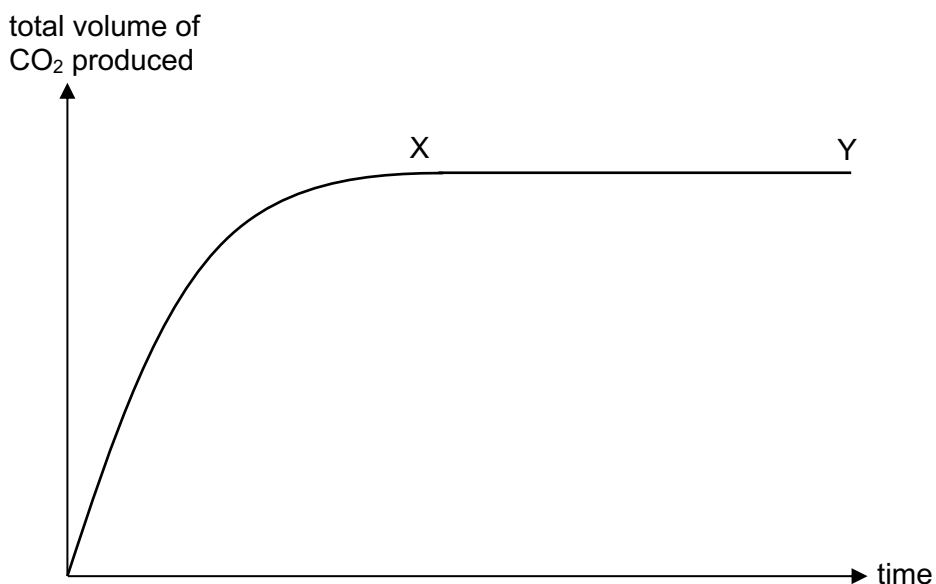
- 26** 6.5 g of zinc foil was added to 20 cm³ of 0.1 mol/dm³ dilute sulfuric acid and the volume of hydrogen evolved was recorded at regular time intervals.

In a separate experiment, the same mass of zinc foil was added to 40 cm³ of the same solution of dilute sulfuric acid.

How will the rate of reaction and total volume of hydrogen evolved in this second experiment compare to the first experiment?

	rate of reaction	total volume of hydrogen evolved
A	increases	increases
B	increases	no change
C	no change	no change
D	no change	increases

- 27** The graph shows how total volume of carbon dioxide produced by the reaction between nitric acid and excess sodium carbonate varied with time.



Which statement about section XY of the graph is correct?

- A** All the sodium carbonate has reacted.
- B** No more carbon dioxide is being produced.
- C** The concentration of the acid is decreasing.
- D** The speed of reaction is at a maximum.

- 28 Element X is a solid at room temperature.

X loses one electron per atom to obtain the electronic configuration of a noble gas and it is the least reactive element in its group.

What is element X?

- A** At **B** F **C** Fr **D** Li

- 29 Silver metal has some properties similar to Group I elements.

Which statement about silver is true?

- A** Silver can displace hydrogen from cold water.
B Silver is extracted from its ore by electrolysis.
C Silver reacts with chlorine to form silver chloride which is soluble in water.
D Silver reduces bromine to form silver bromide, AgBr.

- 30 Which oxide is **unlikely** to dissolve in aqueous sodium hydroxide?

- A** Al_2O_3 **B** CO_2 **C** SO_2 **D** MgO

- 31 Three different solutions were electrolysed using inert electrodes.

solution 1 dilute sodium chloride

solution 2 concentrated sodium chloride

solution 3 aqueous copper(II) sulfate

Which solutions produce hydrogen at the negative electrode?

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

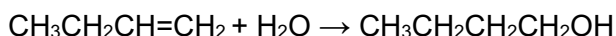
- 32 Which of the following methods would **not** produce ammonia?

- A** adding sodium hydroxide followed by aluminium foil to zinc nitrate solution and heat it
B heating ammonium chloride with potassium hydroxide
C heating ammonium sulfate with dilute nitric acid
D heating concentrated aqueous ammonia

- 33 Which gas is present in the exhaust fumes of a car engine in a much greater amount than any other gas?
- A carbon dioxide
 - B carbon monoxide
 - C nitrogen
 - D water vapour

- 34 Which statement about the fractions of crude oil is correct?
- A Fractions containing bigger hydrocarbons are found nearer to the top of the fractionating column.
 - B Kerosene burns with a more smoky flame than diesel.
 - C Lubricating oil is more viscous than diesel.
 - D Petrol boils at a higher temperature range compared to kerosene.

- 35 Butene reacts with steam in the presence of sulfuric acid as shown in the equation.

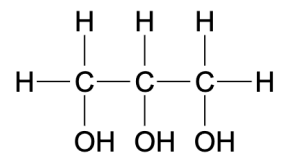


What type of reaction is this?

- A acid-base
 - B addition
 - C hydrolysis
 - D substitution
- 36 In the presence of ultraviolet light, ethane and chlorine react to give a mixture of products. Which compound is a possible product of the reaction?
- A CH_3Cl B $\text{CH}_2\text{ClCH}_2\text{Cl}$ C $\text{CH}_2=\text{CHCl}$ D $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$
- 37 Which molecule **cannot** be obtained from the cracking of a molecule of nonane, $\text{CH}_3(\text{CH}_2)_7\text{CH}_3$?
- A $\text{CH}_2=\text{CHCH}=\text{CH}_2$
 - B $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$
 - C $(\text{CH}_3\text{CH}_2\text{CH}_2)_3\text{CH}$
 - D H_2

- 38** Propane-1,2,3-triol is a raw material for many important industrial chemical processes.

The structure of propane-1,2,3-triol is shown.



Which statements about propane-1,2,3-triol are correct?

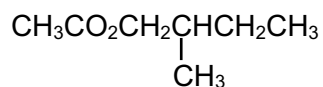
statement 1 It can be used as a solvent and a fuel.

statement 2 It reacts with acidified KMnO_4 to form carboxylic acids.

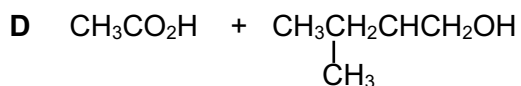
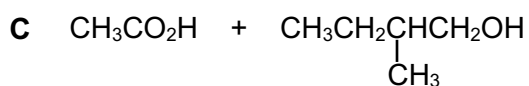
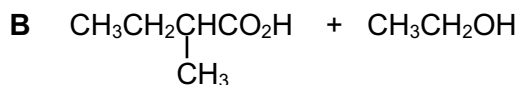
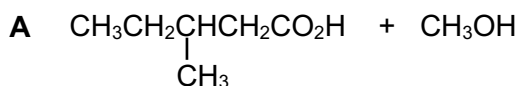
statement 3 It reacts with carboxylic acids to form compounds containing up to three ester groups.

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

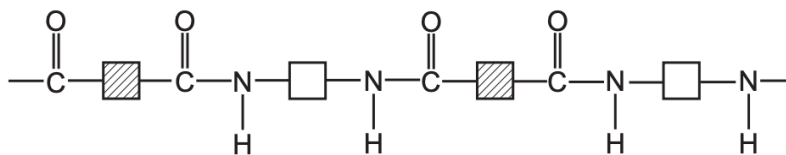
- 39** Molecule X has the following formula.



Which alcohol and acid can react together under suitable conditions to produce X?



40 Polymer Y has the following structure.



Which is correct about polymer Y?

- A It is a form of polyester.
- B It is formed by addition polymerisation.
- C It is produced when monomers containing carboxylic acid functional group reacts with monomers containing alcohol functional group.
- D Water is eliminated in the polymerisation process to form Y.

The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	0
1 H hydrogen 1 proton (atomic) number atomic symbol name relative atomic mass 4 Be beryllium 9 12 Mg magnesium 24																	
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 -		114 Fl flerovium -		116 Lv livermorium -		
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 dm³ at room temperature and pressure (r.t.p.).