



YUHUA SECONDARY SCHOOL

PRELIMINARY EXAMINATION 2022

SECONDARY FOUR EXPRESS

4E	CANDIDATE NAME			
	CLASS		INDEX NUMBER	

CHEMISTRY

6092/01

Paper 1 Multiple Choice

29 August 2022
1 hour

Additional Materials : Multiple Choice Answer Sheet

Setter: Ms Cerenna Ng

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your *Name*, *Class* and *Class Index Number* on the Answer Sheet in the spaces provided unless this has been done for you.

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.

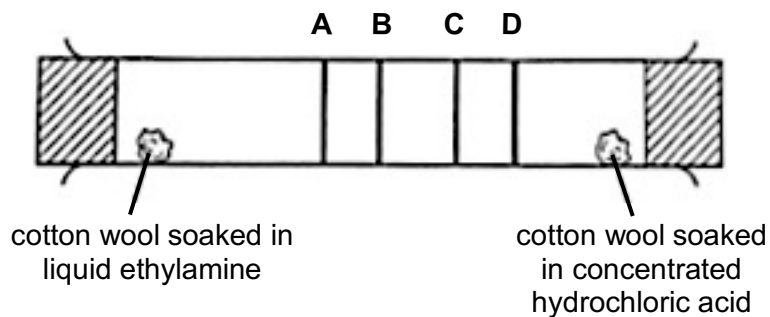
A copy of the Periodic Table is printed on page 16.

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

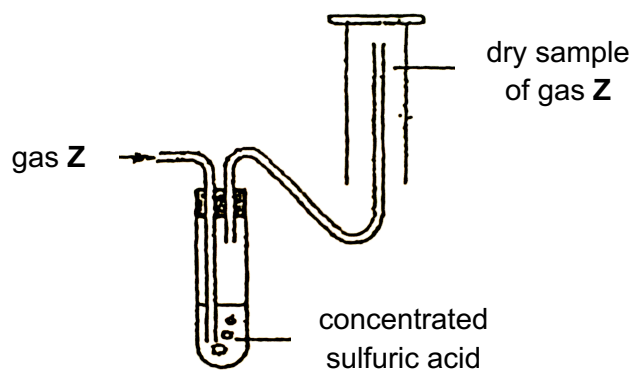
- 1 Liquid ethylamine and hydrochloric acid are volatile substances.

Ethylamine gas, $\text{C}_2\text{H}_5\text{NH}_2$, and hydrogen chloride gas, HCl , react to form a white solid, ethylamine hydrochloride.

At which position in the tube would a ring of white solid ethylamine hydrochloride form?



- 2 The diagram shows a method to collect a dry sample of gas **Z**.



Which information can be deduced about gas **Z**?

- 1 **Z** is an alkaline gas.
- 2 **Z** is less dense than air.
- 3 **Z** is very soluble in water.

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

- 3 A series of experiments was conducted on a newly discovered substance.

Which observation suggests that the substance **cannot** be an element?

- A Electrolysis of the molten substance produces two products.
- B The substance dissolves in water to give a colourless solution.
- C The substance has a fixed melting point.
- D When the substance is heated in air, a white solid is formed.

- 4 In an experiment, a solid **P** is found to melt at 121 °C, the same temperature as the melting point of benzoic acid.

In another experiment, some solid **P** is mixed with pure solid benzoic acid. The melting point of the mixture is found to be 116 °C.

What can be concluded from the two experiments?

- A **P** is a mixture.
- B **P** is not benzoic acid.
- C **P** is a pure compound.
- D **P** is impure benzoic acid.

- 5 Compound **A** consists of a lattice of positive ions of **Y** and negative ions of **Z**. Each positive ion is surrounded by eight negative ions and each negative ion is surrounded by four positive ions.

Which option correctly shows the chemical formula of compound **A** and ions present in compound **A**?

	chemical formula	ions present
A	YZ_2	$\text{Y}^{2+}, \text{Z}^-$
B	Y_2Z	$\text{Y}^+, \text{Z}^{2-}$
C	ZY_2	$\text{Y}^{2+}, \text{Z}^-$
D	Z_2Y	$\text{Y}^+, \text{Z}^{2-}$

- 6 An atom of one isotope of uranium is represented by the symbol ${}^{235}_{92}\text{U}$.

Which row is correct for an atom of a different isotope of uranium?

	nucleon number	number of protons	number of neutrons
A	147	92	147
B	239	92	147
C	235	92	143
D	239	147	239

- 7 Dilute sulfuric acid is added to a mixture of excess copper, excess magnesium, and excess lead in a beaker. The beaker is left for about 10 minutes and its contents are then filtered.

What does the filtrate contain?

- A** copper(II) sulfate, magnesium sulfate, and lead(II) sulfate
- B** copper(II) sulfate and magnesium sulfate
- C** lead(II) sulfate and magnesium sulfate
- D** magnesium sulfate

- 8 Silicon and carbon are in the same group of the Periodic Table.

Which chemical formula containing silicon is incorrect?

- A** CaSiO_2
- B** SiCl_4
- C** SiH_4
- D** SiHCl_3

- 9 Element **Z** forms an ion with 2+ charge.

An ion of **Z** has a nucleon number of 226 and 86 electrons.

Which statement about an ion of **Z** is correct?

- A** It has 140 neutrons.
- B** It has 2 electrons in its valence shell.
- C** It has 86 protons.
- D** It has the same number of nucleons as an atom of **Z**.

- 10 A student wants to prepare calcium sulfate.

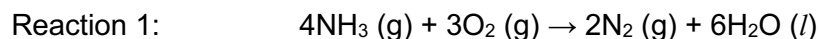
Which pair of reagents are the most suitable for making calcium sulfate?

- A calcium and sulfuric acid
- B calcium carbonate and sulfuric acid
- C calcium nitrate and sulfuric acid
- D calcium oxide and sulfuric acid

- 11 Which gas contains the same number of atoms as 9 g of water?

- A 1 g of hydrogen
- B 15 g of neon
- C 24 g of ozone
- D 44 g of carbon dioxide

- 12 The combustion reaction of ammonia gas and carbon are shown below.



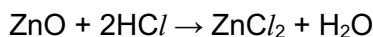
80 cm³ of ammonia burns in 80 cm³ of oxygen and the resulting gas mixture is reacted with an excess of carbon.

What is the total volume of gases that would be collected at the end of the second reaction?

- A 20 cm³
- B 40 cm³
- C 60 cm³
- D 160 cm³

- 13 Zinc oxide has antibacterial properties and is commonly used in the treatment of skin conditions.

Zinc oxide reacts with hydrochloric acid according to the equation shown below.



When 19 g of impure zinc oxide was reacted with excess hydrochloric acid, 23 g of zinc chloride was formed.

What is the percentage purity of the zinc oxide used?

- A 42.9 %
- B 59.5 %
- C 72.1 %
- D 82.6 %

- 14 Each of the following solutions has a concentration of 0.5 mol/dm^3 .

Which solution contains the greatest number of ions in 1 dm^3 of solution?

- A calcium hydroxide
- B ethanoic acid
- C ethanol
- D nitric acid

- 15 Chromium(III) sulfate reacts with sodium carbonate to produce a precipitate of chromium(III) carbonate.

Which row shows the solubility of chromium(III) sulfate, sodium carbonate and chromium(III) carbonate?

	chromium(III) sulfate	sodium carbonate	chromium(III) carbonate
A	insoluble	soluble	insoluble
B	soluble	soluble	insoluble
C	insoluble	insoluble	soluble
D	soluble	soluble	soluble

- 16 What does the term *strong acid* mean in relation to hydrochloric acid, HCl ?

- A Each molecule can produce two hydrogen ions.
- B It is fully ionised in aqueous solution.
- C Its aqueous solution has a pH greater than 7.
- D Its salt, lead(II) chloride, is insoluble in water.

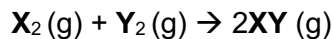
- 17 Imidazole dissolves in water to give a weak alkaline solution.

A few drops of Universal Indicator are added to an aqueous solution of imidazole.

Which row shows the pH of the solution and the colour of the solution after the indicator has been added?

	pH	colour of solution
A	greater than 7	blue
B	greater than 7	purple
C	less than 7	blue
D	less than 7	purple

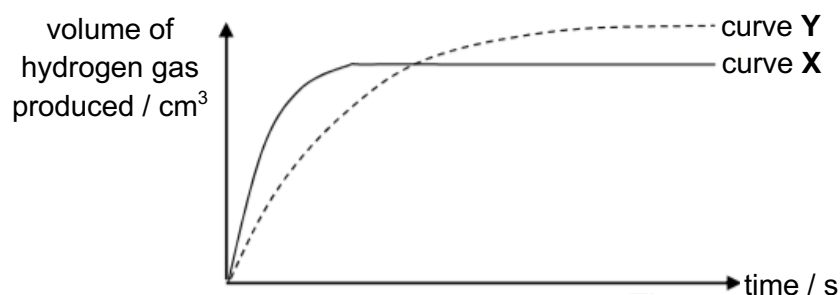
- 18 The reaction represented by the following equation occurs by collisions between X_2 and Y_2 molecules.



Which statement(s) is/are correct?

1	All collisions between X_2 and Y_2 molecules produce XY molecules.
2	The frequency of collisions is increased by raising the concentration of X_2 and Y_2 molecules in the reaction mixture.
3	The frequency of collisions is unaffected by raising the pressure exerted on the reaction mixture.
4	The frequency of collisions is increased by a rise in the temperature of the reaction mixture.

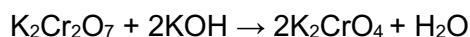
- A** 1 and 3
B 1, 2 and 3
C 2 and 4
D 4 only
- 19 In the graph below, curve X was obtained by the reaction between 100 cm³ of 1 mol/dm³ hydrochloric acid and 5 g of zinc granules.



Which change could produce curve Y?

- A** 200 cm³ of 0.8 mol/dm³ hydrochloric acid
B 50 cm³ of 1.5 mol/dm³ hydrochloric acid
C same mass of zinc powder
D increasing the temperature by 15 °C

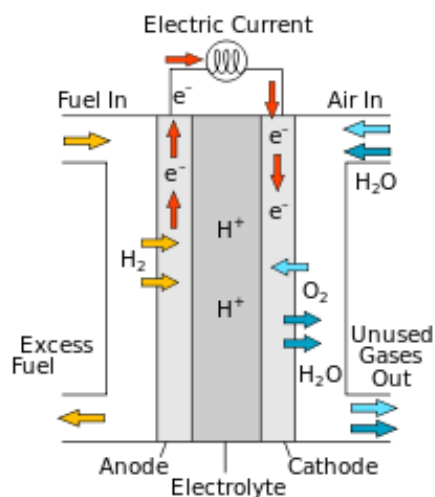
- 20 Potassium dichromate(VI) reacts with aqueous potassium hydroxide as shown below.



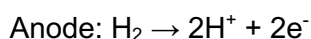
Which option correctly shows the changes to the oxidation state of chromium and the pH of the reaction mixture?

	oxidation state of chromium	pH of mixture
A	decreases	decreases
B	decreases	increases
C	remains the same	decreases
D	remains the same	increases

- 21 The following diagram shows an acidic fuel cell.



The half equations are given below.



Which option shows the overall equation for the acidic fuel cell?

- A** $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
- B** $\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
- C** $\text{H}_2 + 2\text{H}^+ + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
- D** $2\text{H}_2 + 4\text{H}^+ + \text{O}_2 \rightarrow 2\text{H}_2\text{O} + 4\text{H}^+$

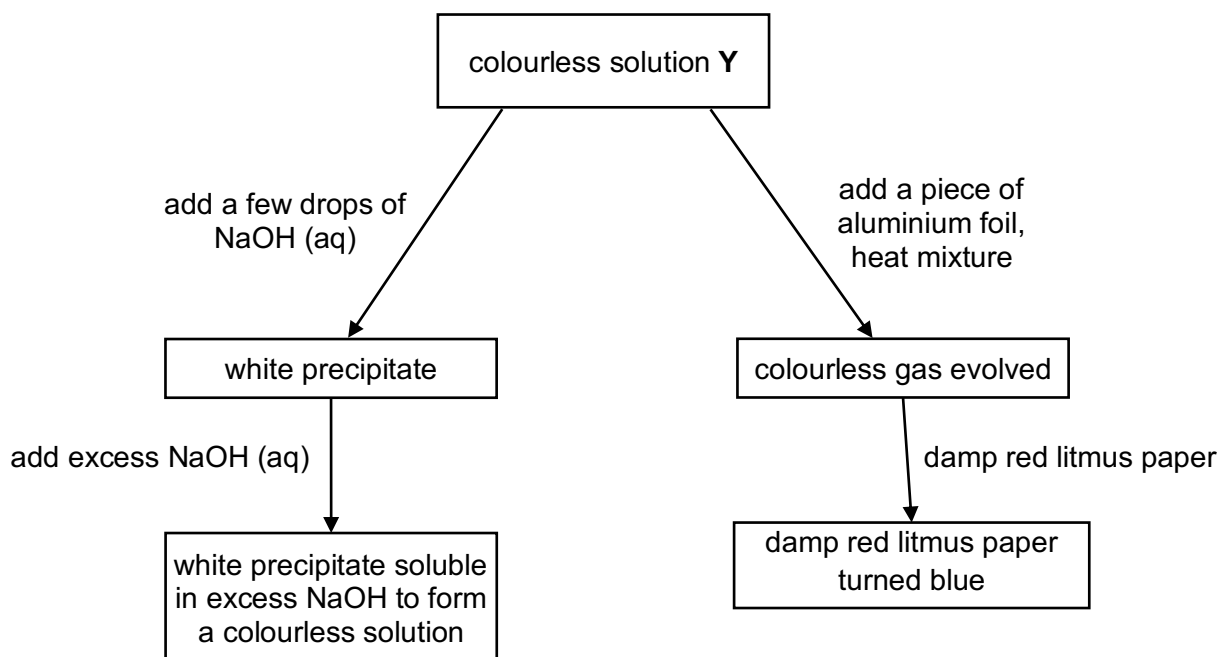
- 22 What is the effect of a catalyst on the activation energy and enthalpy change of an exothermic reaction?

	activation energy	enthalpy change
A	decreases	decreases
B	increases	no change
C	decreases	no change
D	increases	decreases

- 23 Which substance is unlikely to react with aqueous sodium hydroxide?

- A ammonium sulfate
- B carbon dioxide
- C copper(II) carbonate
- D nitric acid

- 24 The flow chart outlines the results of a series of tests on solution Y.



What is the possible identity of solution Y?

- A aluminium sulfate
- B ammonium chloride
- C calcium nitrate
- D zinc nitrate

- 25 Astatine is an element in Group VII of the Periodic Table.

What deduction can be made about the element astatine?

- A It is more reactive than iodine.
- B It forms a covalent compound with sodium.
- C It is a gas at room temperature and pressure.
- D It can be displaced from aqueous potassium astatide by chlorine.

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

The oxides of X and Z react readily with hydrochloric acid while the oxides of Y and Z react readily with sodium hydroxide.

If X, Y and Z are placed in increasing proton number, which order is correct?

- A X, Z, Y
- B X, Y, Z
- C Y, Z, X
- D Y, X, Z

- 27 When metal M was placed in aqueous copper(II) nitrate, a brown deposit was obtained and the colour of the blue solution faded.

The temperature of the reaction mixture increased.

Which conclusion cannot be deduced from this information?

- A The reaction is exothermic.
- B Metal M is a stronger reducing agent than copper.
- C Metal M is more reactive than copper.
- D M has the same valency as copper.

- 28 Which equation does **not** represent a redox reaction?

- A $\text{Ca}^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{CaSO}_4(\text{s})$
- B $\text{Cu}^{2+}(\text{aq}) + \text{Zn}(\text{s}) \rightarrow \text{Cu}(\text{s}) + \text{Zn}^{2+}(\text{aq})$
- C $\text{Cl}_2(\text{g}) + \text{S}^{2-}(\text{aq}) \rightarrow \text{S}(\text{s}) + 2\text{Cl}^{-}(\text{aq})$
- D $\text{Zn}(\text{s}) + 2\text{H}^{+}(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + \text{H}_2(\text{g})$

- 29 Which Group VII element acts as the strongest oxidising agent in redox reactions?

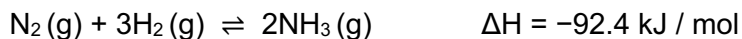
- A bromine
- B chlorine
- C fluorine
- D iodine

- 30 All ammonium salts on heating with sodium hydroxide produce ammonia gas.

From which ammonium salt can the greatest mass of ammonia be obtained?

- A 0.25 mol $(\text{NH}_4)_3\text{PO}_4$
- B 0.25 mol $(\text{NH}_4)_2\text{CO}_3$
- C 0.5 mol NH_4Cl
- D 0.5 mol NH_4NO_3

- 31 Ammonia is manufactured by the Haber process.



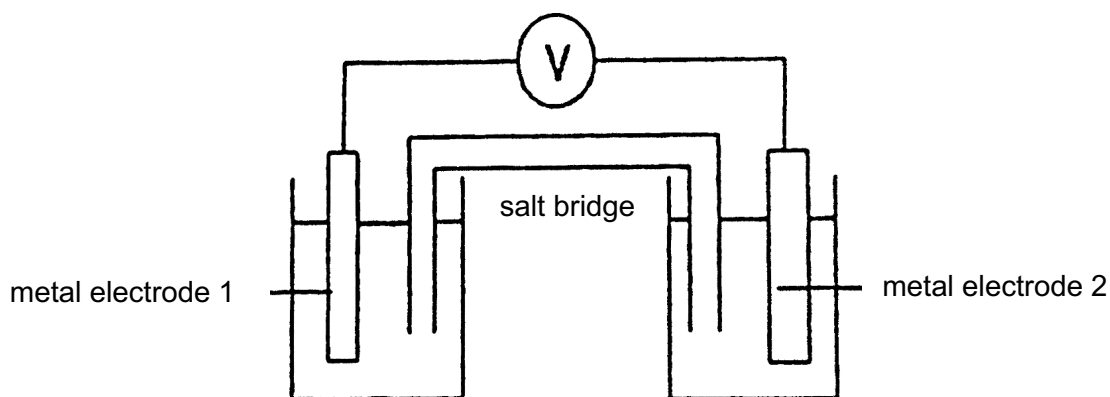
Which statement about the Haber process is **incorrect**?

- A A high temperature will increase the yield of ammonia.
- B Increasing pressure would increase the yield of ammonia.
- C It is not possible to obtain a 100 % yield of ammonia in an industrial setting.
- D Nitrogen is reduced by hydrogen.

- 32 Which electrolyte will increase in pH when electrolysed using platinum electrodes?

- A concentrated copper(II) chloride solution
- B concentrated sodium chloride solution
- C dilute calcium nitrate solution
- D dilute nitric acid

- 33 Four metals, tin, X, Y and Z were connected in pairs as shown in the experimental set-up below, and the voltages were recorded.



The results obtained are shown in the table below.

metal electrode 1	metal electrode 2	voltage (V)
tin	Y	1.1
tin	X	- 0.9
Z	tin	2.5
Z	X	- 1.6

When metal electrode 1 was magnesium and metal electrode 2 was copper, a reading of 2.7 V was recorded.

Which option shows the order of the metals in increasing reactivity?

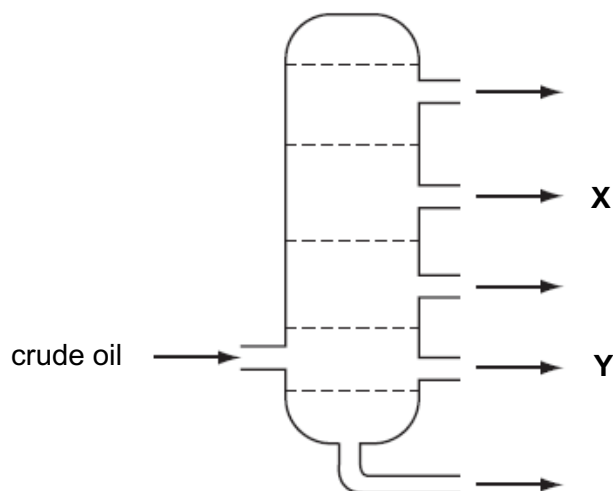
- A X, tin, Y, Z
- B Y, tin, X, Z
- C Y, tin, Z, X
- D Z, Y, tin, X

- 34 Which atmospheric pollutants can be removed by fitting catalytic converters to motor cars?

- I sulfur dioxide
- II carbon monoxide
- III nitrogen oxides
- IV unburnt hydrocarbons

- A I, II and III only
- B I, III and IV only
- C II, III, IV only
- D I, II, III and IV

- 35 The diagram shows the separation of crude oil into fractions.



Which statement is correct?

- A X and Y are pure substances.
 B X condenses at a lower temperature than Y.
 C X has a higher boiling point than Y.
 D The temperature increases up the column.
- 36 Which of the following are isomers?

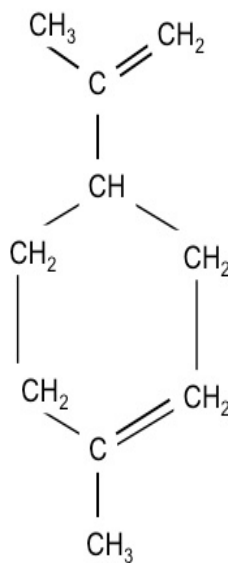
1	2
$ \begin{array}{c} \text{H} \quad \text{H} \quad \text{O} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{O}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array} $	$ \begin{array}{c} \text{H} \quad \text{O} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{O}-\text{C}-\text{C}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array} $
3	4
$ \begin{array}{c} \text{H} \quad \text{O} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{O}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array} $	$ \begin{array}{c} \text{O} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{O}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \end{array} $

- A 1 and 4
 B 1, 2 and 3
 C 1, 2 and 4
 D 1, 2, 3 and 4

- 37 A polyunsaturated fatty acid molecule has a molecular mass of 278.
139 g of this fatty acid molecule reacts completely with 240 g of bromine gas.

How many double bonds are there in one molecule of the fatty acid?

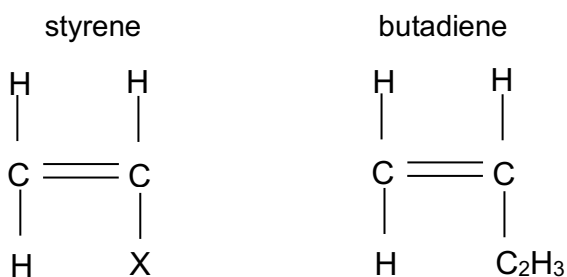
- A 2
B 3
C 6
D 10
- 38 Ethanol is a very useful substance.
Which of the following is **not** a use for ethanol?
- A as a fragrance
B as a fuel
C as a solvent
D making alcoholic beverages
- 39 Liquid limonene is the major component found in the oil of citrus fruit peels. It has the molecular structure shown below.



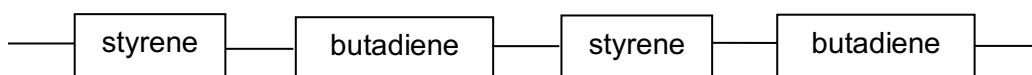
What type of compound is limonene?

- A ester
B polymer
C salt
D unsaturated hydrocarbon

- 40 Styrene – butadiene is a synthetic rubber. It is made by polymerising several units of the monomers shown below.

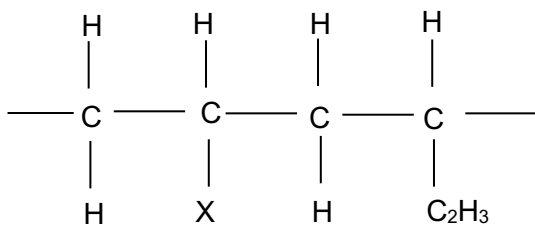


One of the possible structures for the polymer is shown below.

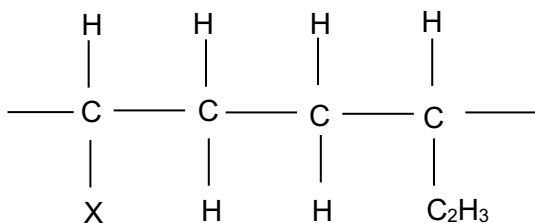


Which structure is **not** a possible repeating unit in this polymer?

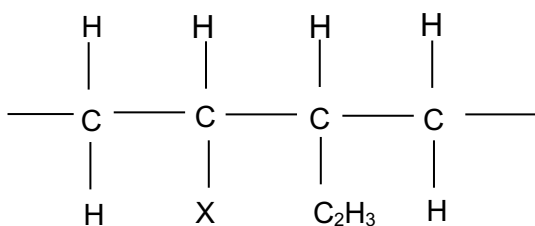
A



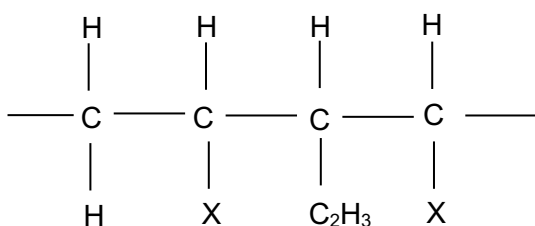
B



C



D



END OF PAPER

