



Geylang Methodist School (Secondary)

Preliminary Examination 2022

CHEMISTRY

Sec 4 Express

Paper 1 Multiple Choice

6092/01

Additional Materials: Multiple Choice Answer Sheet

1 hour

26 August 2022

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, class and index number 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 20.

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

This document consists of **19** printed pages and **1** blank page.

[Turn over

- 1** A gas is evolved during a reaction.
Which two pieces of apparatus would enable the rate of this reaction to be measured?

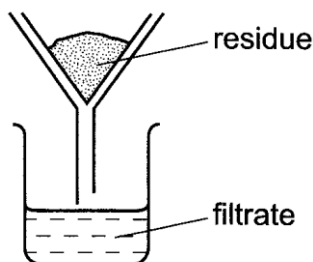
- A** balance and pipette
- B** gas syringe and thermometer
- C** stopwatch and gas syringe
- D** stopwatch and pipette

- 2** The table shows the colours and the solubilities in water of four solids.

solid	colour	solubility in water
W	blue	insoluble
X	blue	soluble
Y	white	insoluble
Z	white	soluble

A mixture containing two of the solids is added to excess water, stirred and filtered.

A blue filtrate and a white residue are obtained.



Which two solids are present in the mixture?

- | | | | |
|----------|---------|----------|---------|
| A | W and X | B | W and Y |
| C | X and Y | D | X and Z |

- 3 A mixture of three liquids is separated by fractional distillation.

Which statements are correct?

- 1 The mixture boils at constant temperature throughout the separation.
- 2 The temperature at which the mixture boils increases during the separation.
- 3 The liquid with the highest boiling point is collected first.
- 4 The liquid with the lowest boiling point is collected first.

A 1 and 3

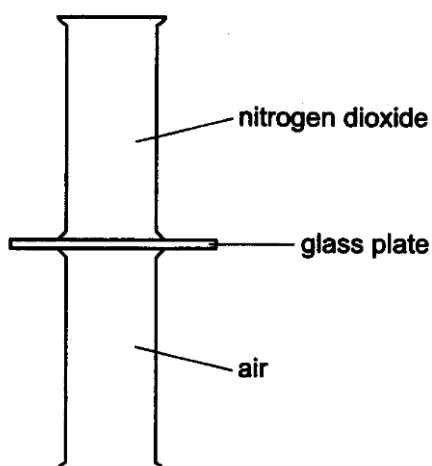
B 1 and 4

C 2 and 3

D 2 and 4

- 4 Nitrogen dioxide is a dark brown gas and is denser 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.

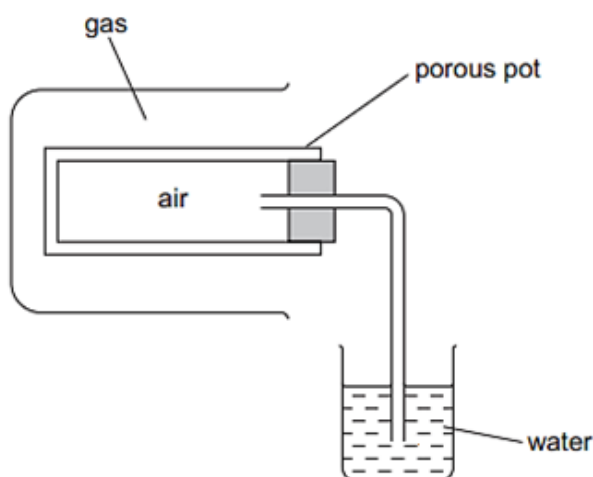


The glass plate is removed.

Which one of the following correctly describes the colours inside the gas jars after a long period of time?

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

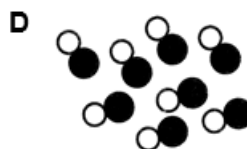
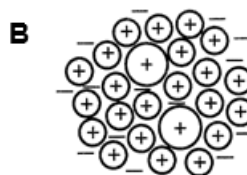
- 5 The apparatus shown in the diagram was used to compare the rate of diffusion between a gas and air.



A beaker containing the gas was placed over the porous pot.

Which gas would cause bubbles to be observed in the beaker of water?

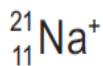
- A carbon dioxide
 B hydrogen
 C oxygen
 D sulfur dioxide
- 6 Which of the following diagrams shows the structure of bronze?



- 7 Tritium is an isotope of hydrogen and has the symbol T.
 Which formula is **incorrect** for a tritium compound?

- A CaOT B NT₃
 C TNO₃ D T₂O

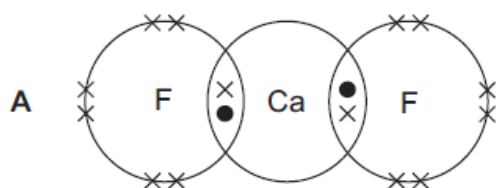
- 8 The symbols for two ions are shown.



Which statement is correct?

- A The fluoride ion contains more electrons than the sodium ion.
- B The sodium ion contains more neutrons than the fluoride ion.
- C The two ions contain the same number of electrons as each other.
- D The two ions contain the same number of protons as each other.

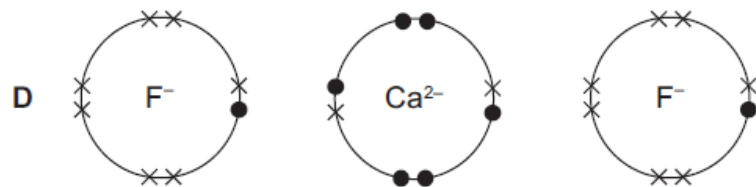
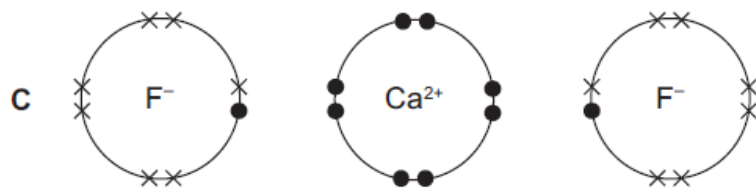
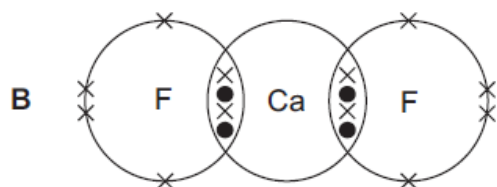
- 9 Which diagram shows the outer electron arrangement in calcium fluoride?



key

• an electron from calcium

x an electron from fluorine



- 10** Which statement shows that graphite and diamond are different forms of the element carbon?
- A** Both graphite and diamond have giant molecular structures.
 - B** Complete combustion of equal masses of graphite and diamond produces equal masses of carbon dioxide and no other products.
 - C** Graphite and diamond have different melting points.
 - D** Graphite conducts electricity, whereas diamond does not.
- 11** An investigation of the properties of the chlorides of Period III elements shows that the boiling points of sodium chloride and silicon tetrachloride are 1465°C and 57°C respectively. This difference in boiling points is a result of
- A** covalent bonds being weaker than ionic bonds.
 - B** sodium chloride having strong metallic bonds.
 - C** silicon tetrachloride having weak intermolecular forces of attraction.
 - D** silicon forming weaker bonds with chlorine than does sodium.
- 12** An organic compound contains 24 g of carbon, 4 g of hydrogen and 32 g of oxygen. What is the empirical formula of the compound?
- A** CHO
 - B** CH₂O
 - C** CH₄O
 - D** C₂H₄O₂
- 13** In an electrolysis experiment, the same amount of charge that deposited 32g of copper deposited 26g of chromium. What is the formula of the chromium ion?
- A** Cr⁺
 - B** Cr²⁺
 - C** Cr³⁺
 - D** Cr⁴⁺

- 14** Which statement about the properties of the elements in Group 0 of the Periodic Table, helium to xenon, is correct?

- A** Argon reacts with iron to form a compound.
- B** Helium is less dense than air.
- C** The elements change from gas to solid down the group.
- D** The elements exist as covalent molecules.

- 15** The table below shows the electronic structure of five elements V, W, X, Y and Z.

element	electronic structure
V	2, 8, 1
W	2, 8, 7
X	2, 8
Y	2, 1
Z	2, 6

Which one of the following statements is **not** true?

- A** V and Y belong to the same Group in the Periodic Table.
 - B** V and W belong to the same Period in the Periodic Table.
 - C** W, X and Z are non-metallic elements.
 - D** X and Z belong to the same Group in the Periodic Table.
- 16** The following observations were made when nickel and iron were placed separately into solutions of metals P, Q and R.

	salt solution of P	salt solution of Q	salt solution of R
nickel	displaced	not displaced	not displaced
iron	displaced	displaced	not displaced

What is the correct order in decreasing reactivity of the five metals?

- A** P, Ni, Fe, Q, R
- B** R, Fe, Ni, Q, P
- C** R, Fe, Q, Ni, P
- D** R, Q, Fe, Ni, P

- 17** The position of metal M in the reactivity series is shown.

K, **M**, Al, Zn, Fe, Cu, Ag

Which method will be used to extract **M** from its ore?

- A** electrolysis of its molten chloride
- B** electrolysis of its aqueous sulfate
- C** reduction of its oxide by heating with coke
- D** reduction of its oxide by heating with hydrogen

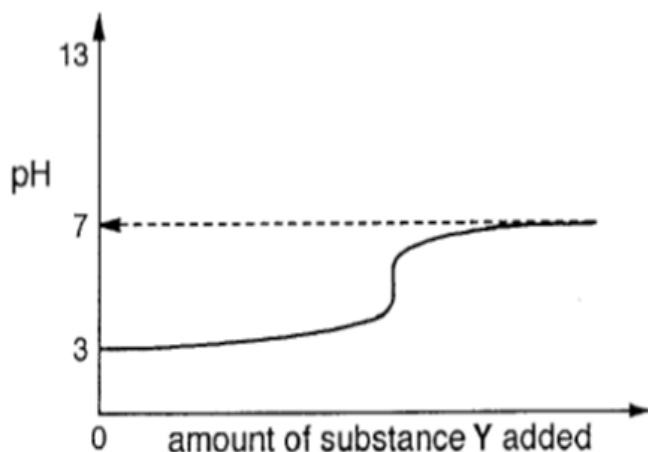
- 18** An unknown solid Y has the following properties.

- Y is stable to heat.
- When dilute acid is added to Y, effervescence of a colourless gas is observed.
- Y dissolves in water to form a colourless solution.
- When aqueous sodium hydroxide is added until in excess to the solution, no visible reaction is observed.

What could be the identity of solid Y?

- A** calcium oxide
- B** sodium carbonate
- C** zinc metal
- D** zinc carbonate

- 19** Substance Y was added bit by bit, with stirring, to aqueous solution Z. The changes in pH of the mixture are shown in the graph.



What could Y and Z be?

	Y	Z
A	aluminium oxide	hydrochloric acid
B	calcium oxide	nitric acid
C	sodium oxide	ethanoic acid
D	zinc oxide	propanoic acid

- 20** Which of the following oxides will **not** react with sulfuric acid?

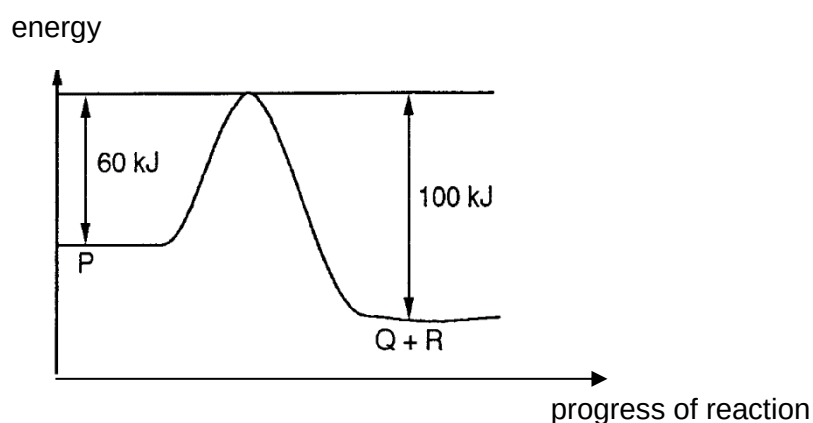
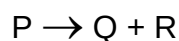
- A** barium oxide
- B** nitrogen dioxide
- C** sodium oxide
- D** zinc oxide

- 21** Which of the following reactants can be safely used to prepare a potassium chloride?
- A** aqueous potassium hydroxide and dilute hydrochloric acid
 - B** aqueous potassium sulfate and aqueous sodium chloride
 - C** potassium and aqueous sodium chloride
 - D** potassium and dilute hydrochloric acid
- 22** Which test is best used to distinguish between calcium chloride and calcium carbonate?
- A** adding aqueous sodium hydroxide
 - B** adding dilute hydrochloric acid
 - C** using damp litmus paper
 - D** using silver nitrate solution
- 23** A salt has the chemical formula $(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$.
Excess aqueous sodium hydroxide was added slowly, with shaking to a hot solution of the salt in a boiling tube until there is no further reaction. The boiling tube was then left to stand for some time.
Which observation would **not** be made?
- A** A green precipitate was produced.
 - B** A pungent gas which turned damp red litmus blue was produced.
 - C** On standing, the precipitate turned brown.
 - D** The precipitate dissolved in excess sodium hydroxide.
- 24** The Haber process is a reversible reaction as some of the ammonia formed is unstable as it decomposes readily back into its reactants.
Which of the following method is used to prevent this from happening?
- A** Adding water to dissolve ammonia.
 - B** Cooling the mixture to liquefy ammonia.
 - C** Filter the mixture to remove ammonia.
 - D** Fractional distil the mixture to separate ammonia gas.

- 25 Which of the following statements best explains why farmers should not lime the soil and add ammonium nitrate fertiliser at the same time?

A The ammonium nitrate makes the soil too alkaline for plant growth.
B The ammonium nitrate will be less soluble in soil that has been limed.
C The lime makes the soil too alkaline for plant growth.
D The lime will react with ammonium nitrate and results in loss of nitrogen.

- 26 The figure below represents the energy profile diagram for the following reaction:

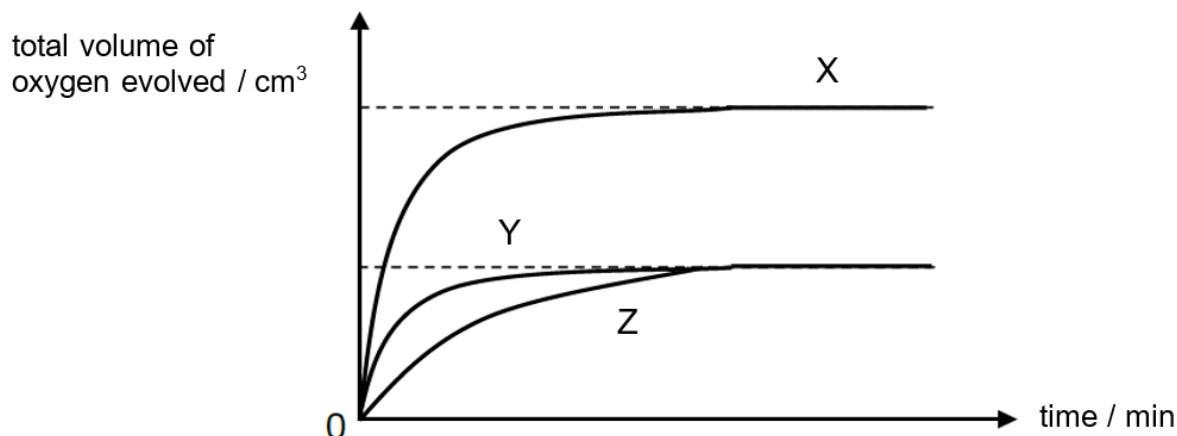


What is the enthalpy change for this reaction?

- A - 100 kJ
B - 40 kJ
C + 40 kJ
D +160 kJ
- 27 Which process does not involve the use of a catalyst?
- A cracking of hydrocarbons
B the extraction of iron from haematite in a blast furnace
C the production of ammonia from nitrogen and hydrogen
D the redox reactions that remove combustion pollutants from car exhausts

- 28** Upon decomposition, hydrogen peroxide produces oxygen gas as one of the products. Three solutions were used in an experiment to study the rate of decomposition of hydrogen peroxide.

- I 50 cm³ of 2.0 mol/dm³ hydrogen peroxide
- II 100 cm³ of 1.0 mol/dm³ hydrogen peroxide
- III 100 cm³ of 2.0 mol/dm³ hydrogen peroxide



Which curves correspond to the respective solutions?

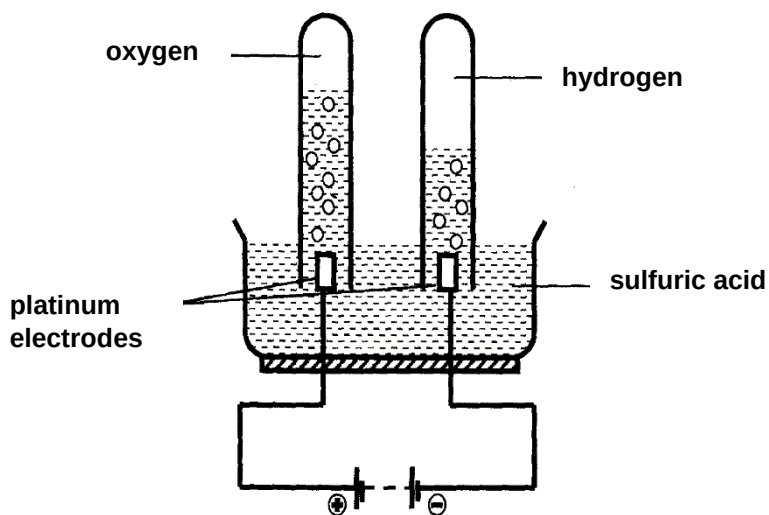
	I	II	III
A	X	Y	Z
B	X	Z	Y
C	Y	Z	X
D	Z	X	Y

- 29** Many reactions involve oxidation and reduction.

Which statement is correct?

- A** Acidified manganate(VII) ions change colour from colourless to purple when reduced.
- B** All reactions that involve oxidation also involve reduction.
- C** During a reaction, oxidising agents lose electrons.
- D** Reduction is the loss of hydrogen from a compound.

- 30 The diagram represents an experiment in which electric current is passed through dilute sulfuric acid.



Which of the following best explains why the volume of hydrogen is twice the volume of oxygen formed?

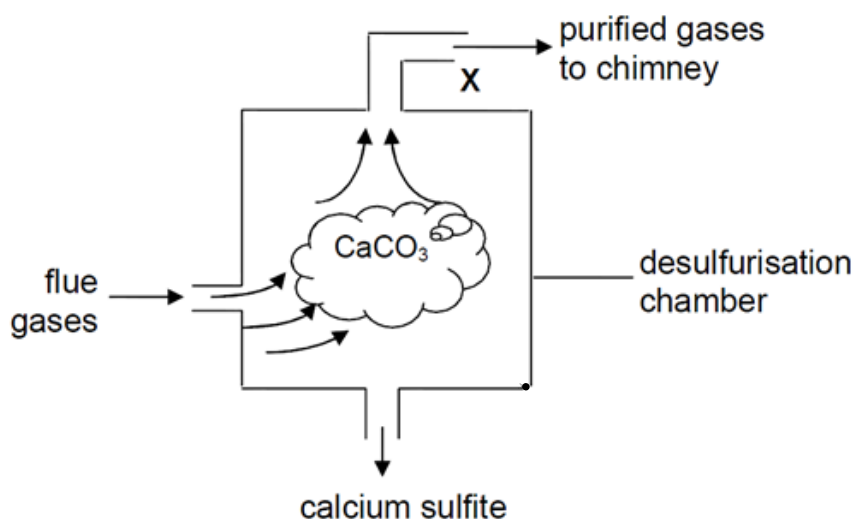
- A Some of the oxygen gas dissolved in the solution.
- B The ratio of hydrogen to oxygen in a water molecule is 2:1.
- C The presence of SO_4^{2-} ions makes it difficult for the oxygen to be formed.
- D The sulfuric acid solution is too dilute.
- 31 In which electrolysis experiment would there be **no** change in the concentration of the electrolyte?

	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

- 32** The carbon cycle regulates the amount of carbon dioxide in the atmosphere. Combustion, photosynthesis and respiration are involved in this cycle. How do these processes affect the amount of carbon dioxide in the atmosphere?

	combustion	photosynthesis	respiration
A	increases	increases	increases
B	increases	decreases	increases
C	decreases	increases	decreases
D	decreases	decreases	decreases

- 33** The following diagram shows a simplified process of desulfurisation.



Which of the following observation at the outlet X best describes the nature of the gases to chimney?

- A** Gases turned acidified potassium manganate (VII) colourless.
- B** Gases turned acidified potassium manganate (VII) purple.
- C** Gases turned acidified potassium iodide brown.
- D** Gases formed white precipitate with lime water.

- 34** The table shows the boiling points of four fractions, **P**, **Q**, **R** and **S**, obtained when crude oil is distilled.

fraction	P	Q	R	S
boiling range /°C	35 – 75	80 – 145	150 – 250	greater than 250

How is fraction **P** different from fraction **S**?

- A** Fraction **P** is more viscous than fraction **S**.
 - B** Fraction **P** contains molecules of larger molecular masses than fraction **S**.
 - C** Fraction **P** is more flammable than fraction **S**.
 - D** Fraction **P** is in less demand than fraction **S**.
- 35** Methane has a boiling point of -161°C .

Which molecular formula and boiling point could be correct for another member in the same homologous series?

	molecular formula	boiling point/°C
A	C_2H_4	-90
B	C_2H_6	-185
C	C_3H_6	-72
D	C_3H_8	-42

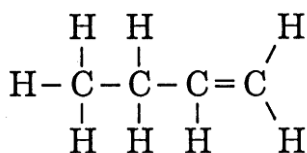
- 36** The reaction between a hydrocarbon C_yH_6 and chlorine can be represented as follows.



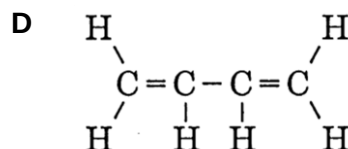
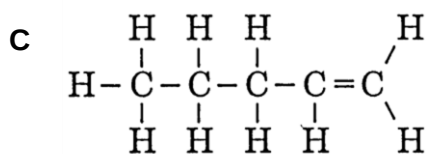
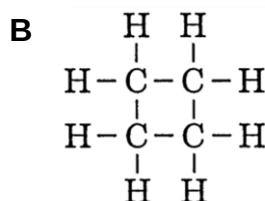
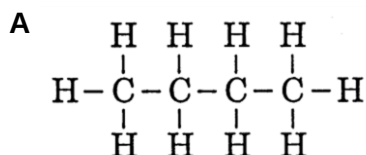
Which of the following statement is correct?

- A** It is an addition reaction.
- B** Ultraviolet light is required for the reaction to take place.
- C** The molecular formula of the hydrocarbon is C_3H_6 .
- D** High temperature and a catalyst are required in the reaction.

- 37** The structure of but-1-ene is shown below.



Which one of the following structures is an isomer of but-1-ene?

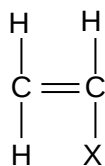


- 38** The table shows the properties of four compounds.

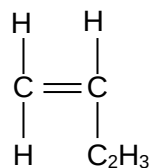
Which compound could be ethanoic acid?

compound	degree of ionisation in water	addition of an aqueous solution of the compound to magnesium
A	high	hydrogen produced
B	high	no reaction
C	low	hydrogen produced
D	low	no reaction

- 39 Styrene-butadiene is a synthetic rubber. It is made by polymerising a mixture of the monomers styrene and butadiene.

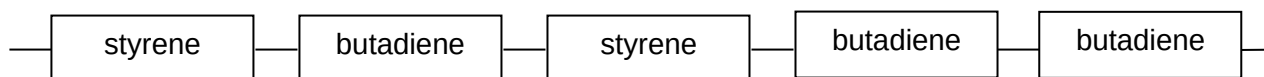


styrene

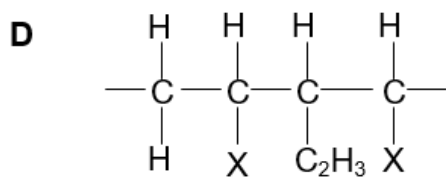
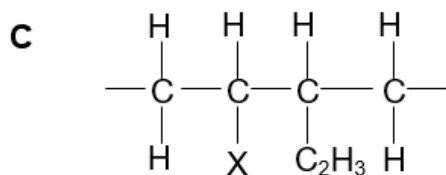
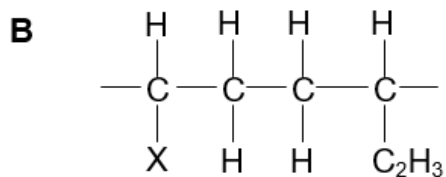
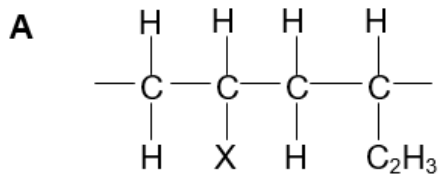


butadiene

One possible structure for the polymer is shown below.



Which of the following is **not** a possible repeating unit in this polymer?



40 Which of the following can be represented by the empirical formula CH_2 ?

- I poly(ethene)
- II poly(propene)
- III butane

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

END OF PAPER

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