

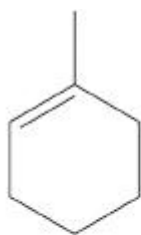
Name of the Student: _____

Max. Marks : 25 Marks

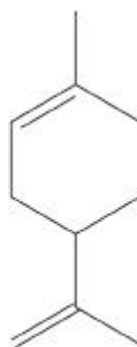
Time : 25 Minutes

Q1.

1-Methylcyclohexene and limonene are cyclic alkenes with a citrus smell.
1-Methylcyclohexene is manufactured and used in the chemical industry.
Limonene is found naturally in orange peel.



1-methylcyclohexene



limonene

- (a) 1-Methylcyclohexene reacts with HBr to form two structural isomers.
The major product is 1-bromo-1-methylcyclohexane.

Name and outline the mechanism for the formation of this major product.

Name of mechanism _____

Outline of mechanism

- (b) Draw the skeletal formula of the minor product formed in the reaction in part (a).

Explain why the products are formed in different amounts.

Skeletal formula

Explanation _____

(4)

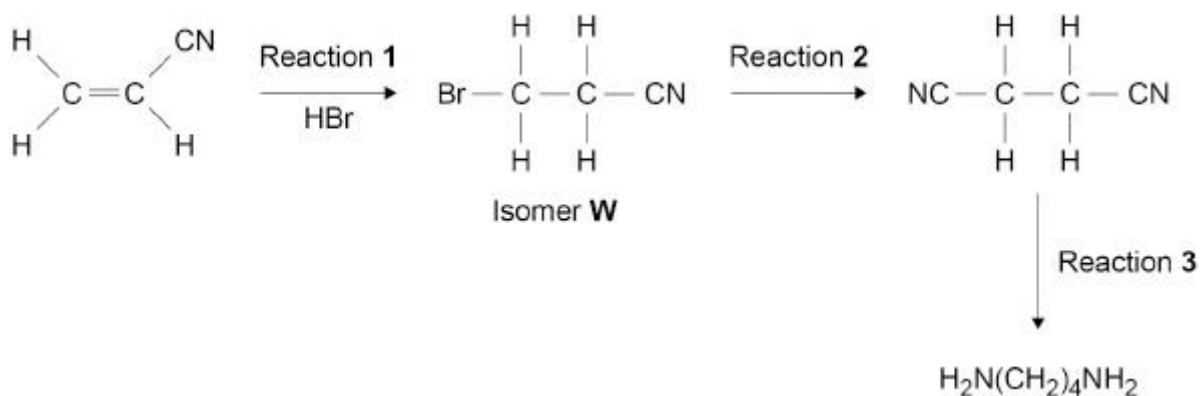
- (c) Draw the structure of the major product when an excess of HBr reacts with limonene.

(1)

(Total 10 marks)

Q2.

Acrylonitrile, $\text{H}_2\text{C}=\text{CHCN}$, can be used as a starting material for the synthesis of butane-1,4-diamine, as shown in this reaction scheme.



- (a) Use IUPAC rules to name isomer **W**.

(1)

- (b) Reaction 1 produces a mixture of **W** and two other isomers.

Draw the structures of the two other isomers.

Explain, by considering the mechanism of this reaction, why all three isomers are formed.

(6)

$$\begin{array}{c}
 \text{H} \quad \quad \text{CN} \\
 \diagdown \quad \diagup \\
 \text{C} = \text{C} \\
 \diagup \quad \diagdown \\
 \text{H} \quad \quad \text{H}
 \end{array}
 \xrightarrow[\text{HBr}]{\text{Reaction 1}}
 \begin{array}{c}
 \text{H} \quad \text{H} \\
 | \quad | \\
 \text{Br}-\text{C}-\text{C}-\text{CN} \\
 | \quad | \\
 \text{H} \quad \text{H}
 \end{array}
 \xrightarrow{\text{Reaction 2}}
 \begin{array}{c}
 \text{H} \quad \text{H} \\
 | \quad | \\
 \text{NC}-\text{C}-\text{C}-\text{CN} \\
 | \quad | \\
 \text{H} \quad \text{H}
 \end{array}
 \xrightarrow{\text{Reaction 3}}
 \text{H}_2\text{N}(\text{CH}_2)_4\text{NH}_2$$

- Condition

(2)

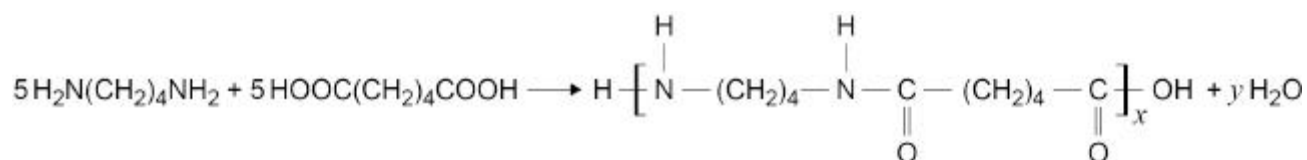
- Downloaded from www.merit-minds.com

Reagent and conditions _____

Equation

(2)

- (e) An incomplete equation for the formation of nylon 4,6 from five molecules of butane-1,4-diamine and five molecules of hexanedioic acid is shown.

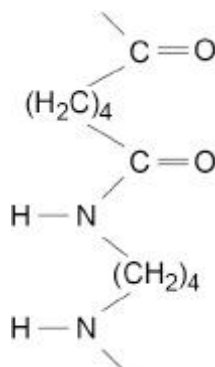


Deduce the values of x and y in this equation.

x _____ y _____

(2)

- (f) The figure below shows a section of the nylon 4,6 polymer molecule.



Draw, on the figure above, another section of nylon 4,6 polymer showing two hydrogen bonds between the two sections.

Draw, on the figure above, another section of nylon 4,6 polymer showing two hydrogen bonds between the two sections.

(2)

(Total 15 marks)