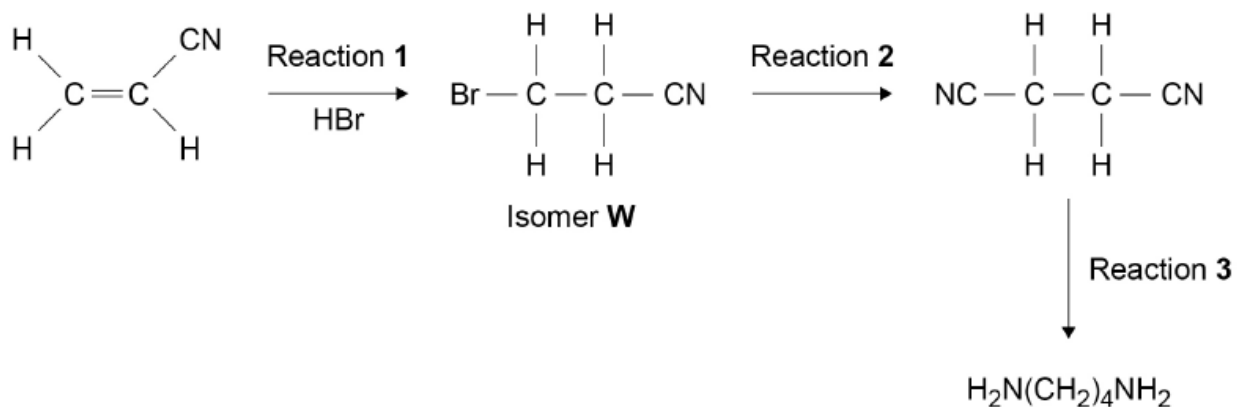


AQA – Organic Synthesis – A2 2023 Chemistry P2 & P3

1. No.4

0 4

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.



0 4 . 1

Use IUPAC rules to name isomer **W**.

[1 mark]

0 4 . 2

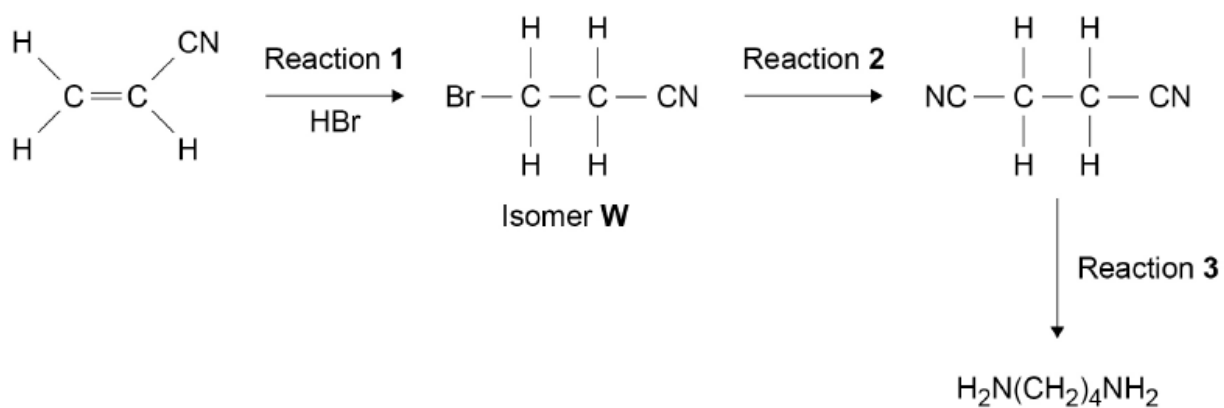
Reaction 1 produces a mixture of **W** and two other isomers.

Draw the structures of the two other isomers.

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

[6 marks]

The reaction scheme is repeated here.



0 4 . 3

Identify the reagent that is warmed with isomer **W** in reaction 2.

State the other reaction condition needed.

[2 marks]

Reagent _____

Condition _____

0 4 . 4

State the reagent and reaction conditions needed for reaction 3.

Give an equation for reaction 3.

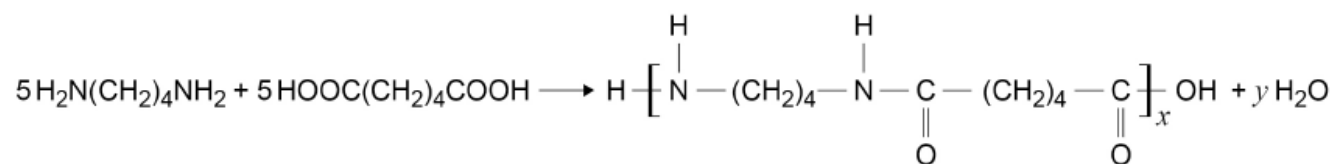
[2 marks]

Reagent and conditions _____

Equation

0 4 . 5

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.

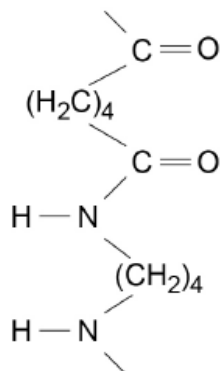
[2 marks]

x _____ y _____

0 4 . 6

Figure 6 shows a section of the nylon 4,6 polymer molecule.

Figure 6

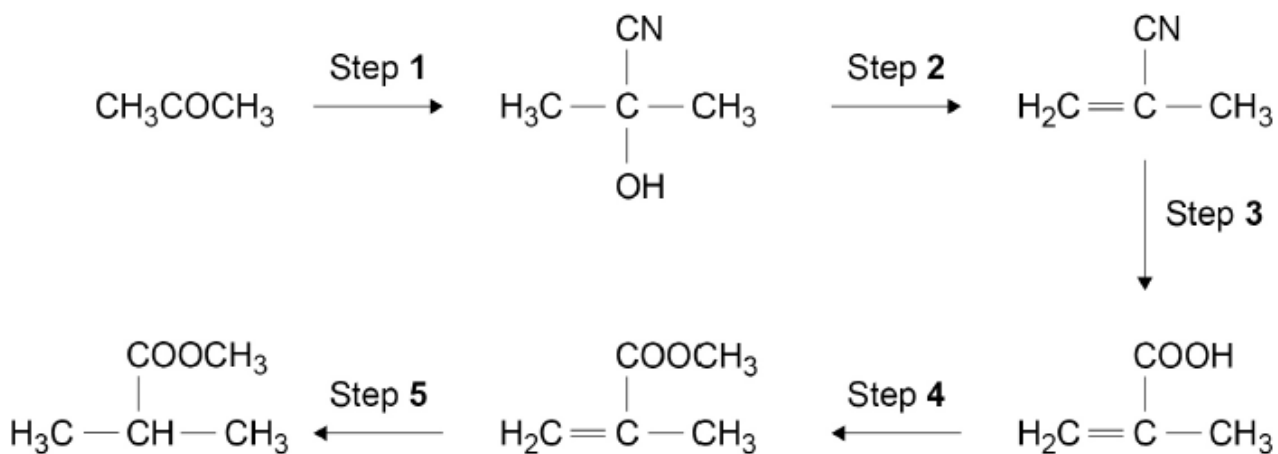


Draw, on Figure 6, another section of nylon 4,6 polymer showing two hydrogen bonds between the two sections.

[2 marks]

2. No.26

Consider this reaction scheme.



Which step is shown with a correct reagent and a correct condition?

[1 mark]

- | | | |
|-----------------|--|--------------------------|
| A Step 1 | HCN dissolved in water | ☐ |
| B Step 2 | KOH dissolved in warm water | ☐ |
| C Step 4 | CH ₃ OH with an alkaline catalyst | ☐ |
| D Step 5 | H ₂ with a nickel catalyst | ☐ |