Alkenes and addition reactions

AQA 7404/7405 · AS content

Answer on your own paper. Show your working where needed.

1. Compare two observations

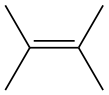
Bromine water is shaken with separate samples of hex-1-ene and hexane at room temperature, away from strong light. Describe the colour observations.

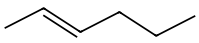
2. Explain the first interaction

A carbon-carbon double bond contains a σ bond and a π bond. Explain why an electrophile reacts with an alkene.

3. Compare two structures

For each alkene shown, decide whether it can have E/Z stereoisomers. Explain your decisions.

A 

B 

4. Assign E or Z

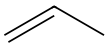
Above a C=C bond are -CH_2CH_3 on the left and H on the right. Below it are -CH_3 on the left and -CH_2OH on the right. Assign E or Z and justify the higher priority on each side.

5. Predict the products

Write the condensed structural formula of the product when ethene reacts with bromine under non-aqueous conditions, and when it reacts with hydrogen bromide. Explain why the HBr reaction gives only one structural product.

6. Draw a mechanism

Alkene A reacts with HBr. Draw and name the mechanism leading to the major product. Show relevant partial charges, full charges and curly arrows.

A 

7. Explain the product mixture

Pent-1-ene reacts with HBr to give two structural products. Draw the intermediate leading to each product. Name both products and explain which forms in greater proportion.

8. Read an addition polymer

A repeat unit contains the backbone pattern -CH_2-$CH(CH_2CH_3)$-. Draw the monomer and explain what happens to its double bond when the polymer forms.

9. Extra challenge · Choose an alkene from reaction evidence

Adding H_2 across the double bond of an alkene C_5H_{10} gives pentane without changing the carbon skeleton. In one stereoisomer, the H atoms on the double-bond carbons are opposite.

Draw and name this isomer with its E/Z prefix. Predict both possible constitutional products with HBr. Explain whether the carbocations alone give a clear basis for choosing a major product.

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