

Solutions

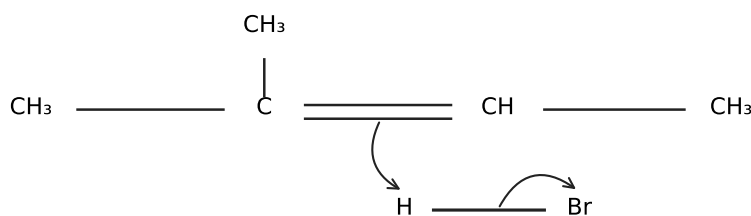
Original-task marking: M1 method, A1 accuracy, B1 reasoning.

2.1 Ethene carries two identical H atoms on each double-bond carbon; geometric isomerism requires two DIFFERENT groups on each carbon, which 1,2-dichloroethene has.

2.2 Compare groups separately on each double-bond carbon: Br > Cl on C1; C > H on C2. On C1 the high-priority group is Br; on C2 it is CH₃. A is Z; B is E.

2.3 Repeat unit $-(\text{CH}_2-\text{CH}(\text{CH}_3))_n$.

3.1 Curly arrow from the π bond to the H of H-Br, and from the H-Br bond to Br; the positive charge sits on the more substituted carbon – the TERTIARY carbocation; A curly arrow starts at a bromide lone pair and ends at the positively charged carbon; major product 2-bromo-2-methylbutane.



H bonds to the CH carbon; C2 becomes a tertiary carbocation.



A bromide lone pair supplies the new bond to C⁺.
Product: CH₃-C(Br)(CH₃)-CH₂-CH₃ (2-bromo-2-methylbutane)

3.2 The observation supports a C=C bond in an appropriate organic test, but many alkenes give the same result, and other reducing substances can also consume bromine. $\text{CH}_2=\text{CH}_2 + \text{Br}_2 \rightarrow \text{CH}_2\text{BrCH}_2\text{Br}$; 1,2-dibromoethane. This is addition: the two-carbon skeleton remains intact and one Br bonds to each carbon.

3.3 CH₂=CHCH₂CH₃, but-1-ene; CH₃CH=CHCH₃, but-2-ene; CH₂=C(CH₃)₂, 2-methylpropene. Only but-2-ene shows E/Z isomerism: each double-bond carbon has H and CH₃, whereas each other isomer has two H on one double-bond carbon.