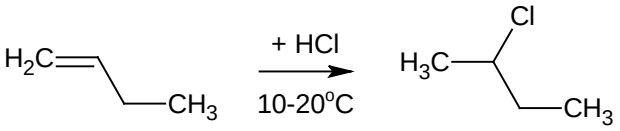
Answer on Question #43034 - Chemistry - Organic Chemistry

Question:

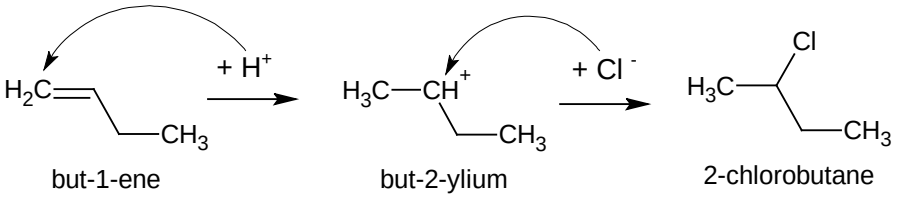
Write the following reaction equation (with a condition) name the product.
But-1-ene + HCl →
Indicate the mechanism of reaction and explain this mechanism (step by step)

Answer:

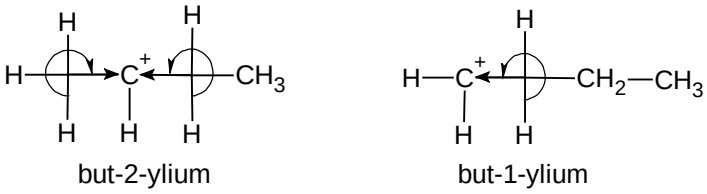
The reaction equation and the product name are as follows



The reaction occurs by **electrophilic addition** mechanism (**A_E**).
The reaction is acid catalyzed. Since HCl is an acid no catalyst is needed.
$HCl \rightarrow H^+ + Cl^-$
Proton is an electrophilic particle, which attacks double bond, which is nucleophilic due to the π-electron cloud. The protonation results in carbocation formation. Afterwards chlorine anion attaches to the positively charged carbon atom resulting in final product formation:



Why only 2-chlorobutane is formed and 1-chlorobutane is not formed?

If the two carbon atoms at the double bond are linked to a different number of hydrogen atoms, the halogen is found preferentially at the carbon with fewer hydrogen substituents. This observation is known as Markovnikov's rule. It is because the proton attaches in such way to form most stable carbocation.

Secondary carbocation of but-2-ylium is more stable than primary carbocation of but-1-ylium because the former is stabilized by 5σ-p hyperconjugation effect (there are 5 C–H bonds in α-position to the charged carbon) and 2 I+ effects (methyl and ethyl groups), while the latter is stabilized by 2σ-p hyperconjugation effect (there are 2 C–H bonds in α-position to the charged carbon) and 1 I+ effect (propyl group) only: