1. Hydrogenation

\[ \text{H}_2 + \overset{\text{Pt, Pd, Ni}}{\text{C} = \text{C}} \xrightarrow{\text{Press, } T} \overset{-\text{C} = \text{C} -}{\text{alkane}} \]

2. Halogenation

\[ \text{C} = \text{C} + X_2 \xrightarrow{\text{inert solvent}} \overset{\text{Br}}{\text{C} = \text{C}} \overset{\text{Br}}{\text{X}} \]

- Example: Propane

\[ \text{CH}_3\text{CH} = \text{CH}_2 + \text{Br}_2 \xrightarrow{\text{CCl}_4} \overset{\text{Br}}{\text{CH}_3\text{CH} - \text{CH}_2} \overset{\text{Br}}{\text{Br}} \]

- Product: 1,2-dibromo-propane

3. Halohydrin formation

\[ X_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{O} + \text{HX} \quad \text{hypohalous acid} \]

- Example: Reaction of chlorine with water

\[ \text{CH}_2 = \text{CH}_2 + \text{Br}_2 + \text{H}_2\text{O} \rightarrow \overset{\text{Br}}{\text{CH}_2\text{CH}_2} + \text{H} + \text{Br} \]

- Product: Chloroethyl alcohol (halohydrin)
(4) **Hydration**

\[
\ce{CH2=CH2 + H2O + H+ → CH3CO2- + H2O} 
\]

In case of unsymmetrical double bond, the Markovnikov Rule applies as follows:

- **Markovnikov Rule (1869)**

\[
\ce{CH3CH2CH=CH2 + H2O + H+ → CH3CH2CH2CH3} 
\]

Where the double bond reacts with the hydrogen ion, resulting in the addition of hydrogen on the carbon with the higher number of hydrogens.

- **Example:**

\[
\ce{CH2=CH2 + H2O + H+ → CH3-CH=CH2} 
\]

(5) **Hydrogen halide**

\[
\ce{C6H6 + HBr → C6H5Br} 
\]

Unsymmetrical double bond reacts with or anti Markovnikov.