Energy of Stabilization

\[ \text{Cyclohexene} + H_2 \xrightarrow{Pt} \text{Cyclohexane} \]
\[ \Delta H^0 = -28.6 \text{ kcal/mol} \]

\[ \text{1,3-cyclohexadiene} + H_2 \xrightarrow{Pt} \text{Cyclohexene} \]
\[ \Delta H^0_{\text{calc}} = 2x-28.6 = -57.2 \text{ kcal/mol} \]
\[ \Delta H^0_{\text{exp}} = -55.4 \]
\[ \Delta H^0_{\text{calc}} = 3x-28.6 = -85.8 \]  
\[ \Delta H^0_{\text{exp}} = -98.8 \]

\[ \text{Diff} \quad \Delta H^0_{\text{exp}} - \Delta H^0_{\text{calc}} = -36 \text{ kcal/mol} \]

Benzene more stable than 1,3,5-cyclohexatriene

-36 kcal/mol = Energy of Stabilization = Delocalization = Resonance Energy

Conjugation & delocalization

Conjugation = double bond after single bond

\[ \text{CH}_2-\text{CH}=\text{CH}-\text{CH}_2 \leftrightarrow \text{CH}_2=\text{CH}-\text{CH}=\text{CH}_2 \leftrightarrow \text{CH}_2=\text{CH}-(\text{CH}_2)_{\text{II}} \]

- Bond length: \( c-c = 1.34 \text{ Å} \)  
- Ethene: \( \text{CH}_2=\text{CH}_2 = 1.34 \text{ Å} \)
- All carbon have \( sp^2 \): bond 2 \& 3 is not Single I not Double

Double
Resonance Structure is between II & III hybrid

\[ CH_2=CH=CH=CH_2 \]

Resonance Hybrid
- all electron of C bond (4) delocalized

Resonance Theory

All four structures contribute

Molecular Orbitals
- 2 electrons delocalized throw 2p orbitals overlay.
- The bonds become shorter than single bond

\[ CH_2=CH=CH=CH_2 \]

\[ CH_2=CH=CH_2 + CH=CH=CH_2 \]