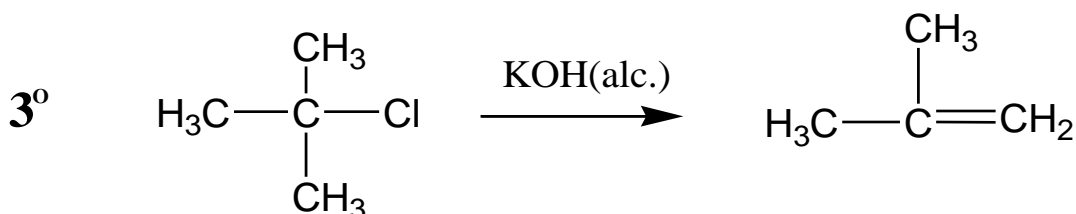
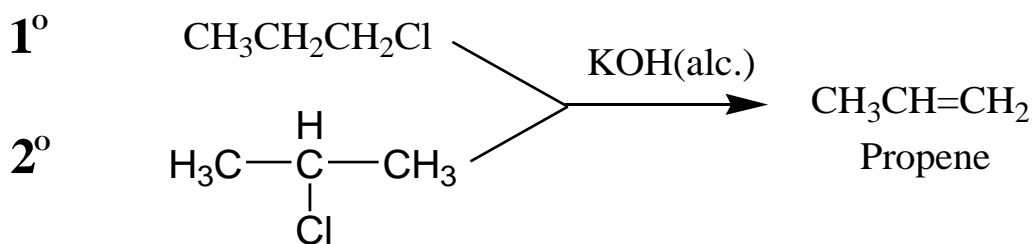
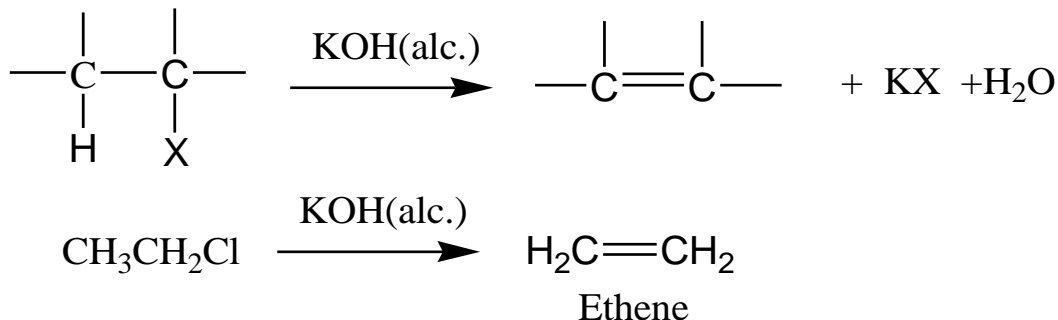


Synthesis of Alkenes

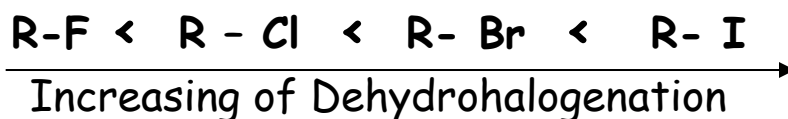
(Via Elimination reactions)

1- Dehydrohalogenation of alkyl halides: (by the action of alcoholic KOH).



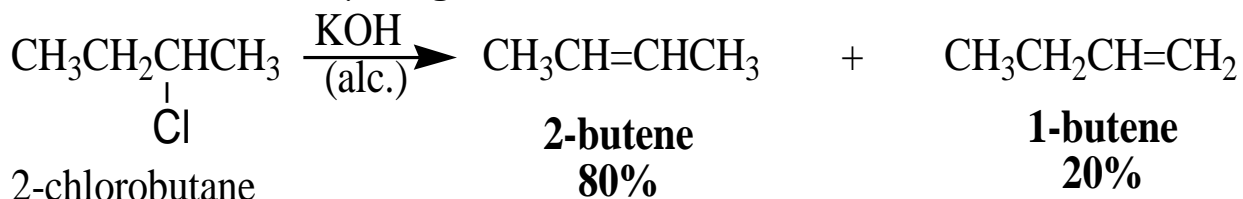
The ease of Dehydrohalogenation of alkyl halides is in the order: $3^\circ > 2^\circ > 1^\circ > \text{CH}_3\text{X}$ (Why?)

The rate of elimination depends on the halogen, reactivity of alkyl halides increasing with decreasing strength of the C-X bond.



ZAITSEV'S RULE:

In Dehydrohalogenation (-HX) of alkyl halides or dehydration (-H₂O) of alcohol the hydrogen atom will be eliminated easily from the carbon atom which is attached to the lower number of hydrogen atoms.

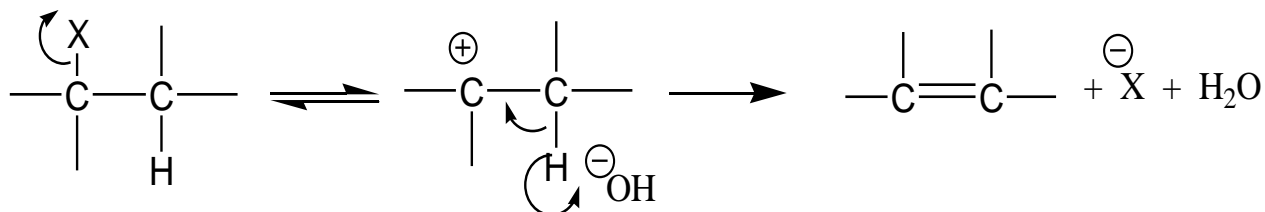


Mechanism:

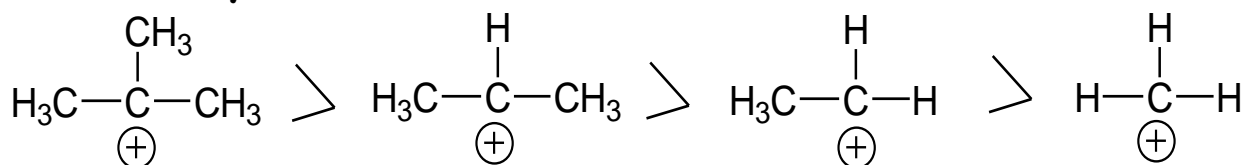
The Dehydrohalogenation of alkyl halides is an elimination reaction that called 1,2-elimination and take place either by **E₁** (unimolecular) or **E₂** (bimolecular) mechanism depending on the structure of alkyl halide.

a) E₁ (unimolecular) mechanism:

Where C-X bond is broken first and a carbonium ion as intermediate will be formed.



The stability of the carbonium ion:



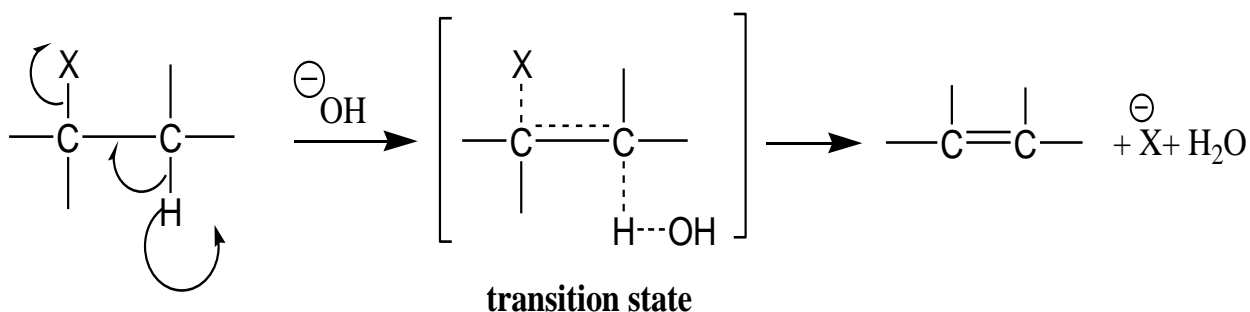
3° carbonium ion > 2° carbonium ion > 1° carbonium ion > CH₃⁺

This can be interrelated in the term of hyperconjugation and the inductive effect, where the alkyl groups have (+I)

[electrons-donor] which increase the electron cloud and so decrease the +ve charge on Carbonium ion [decreasing the charge on ion \Rightarrow more stable].

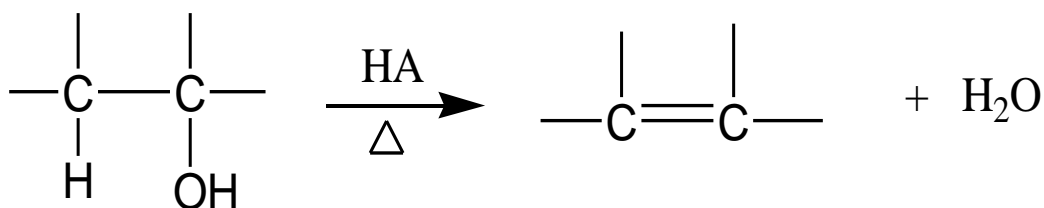
a) E₂ (bimolecular) mechanism:

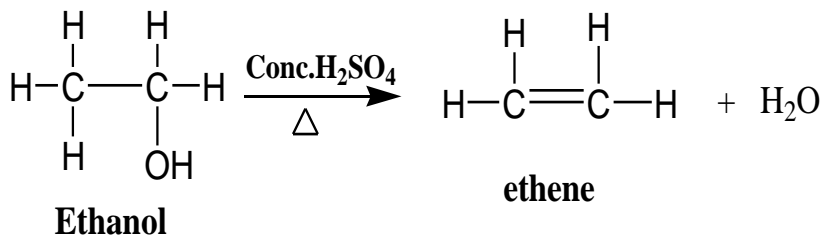
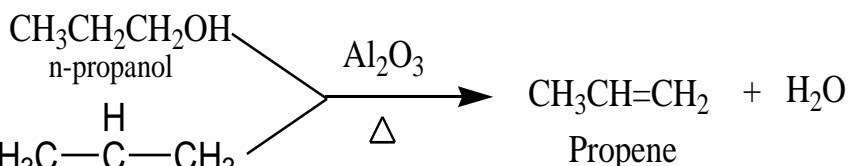
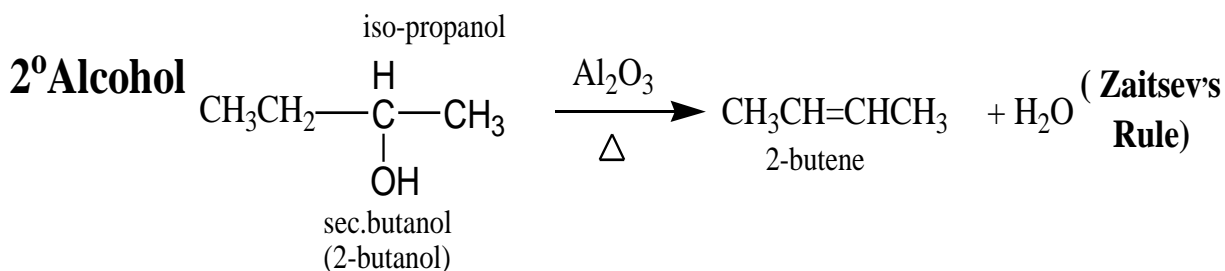
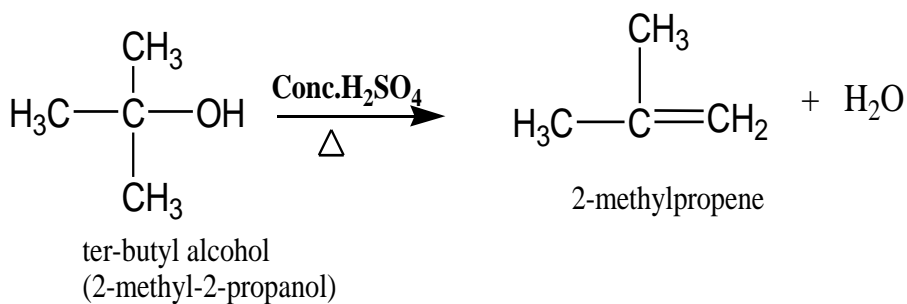
Where the reaction take place in one step by forming transition state. This transition state is more stable; when the free energy of activation for the reaction is lower and the product is formed faster [that has the more highly substituted double bond].

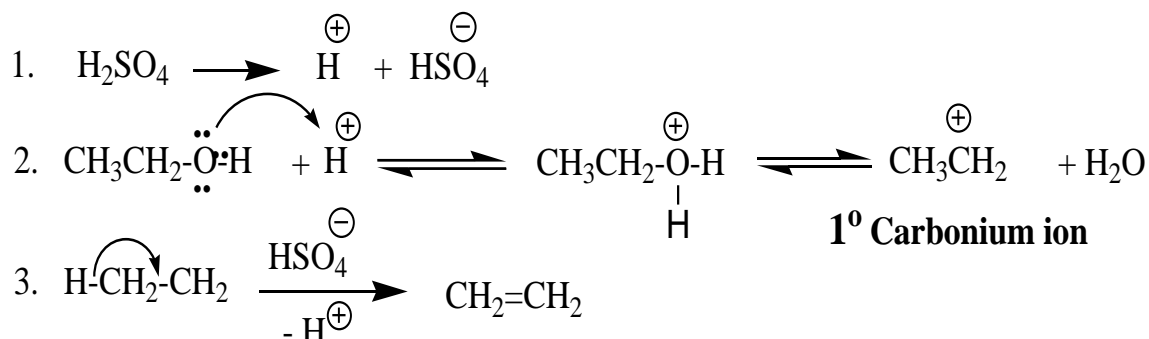
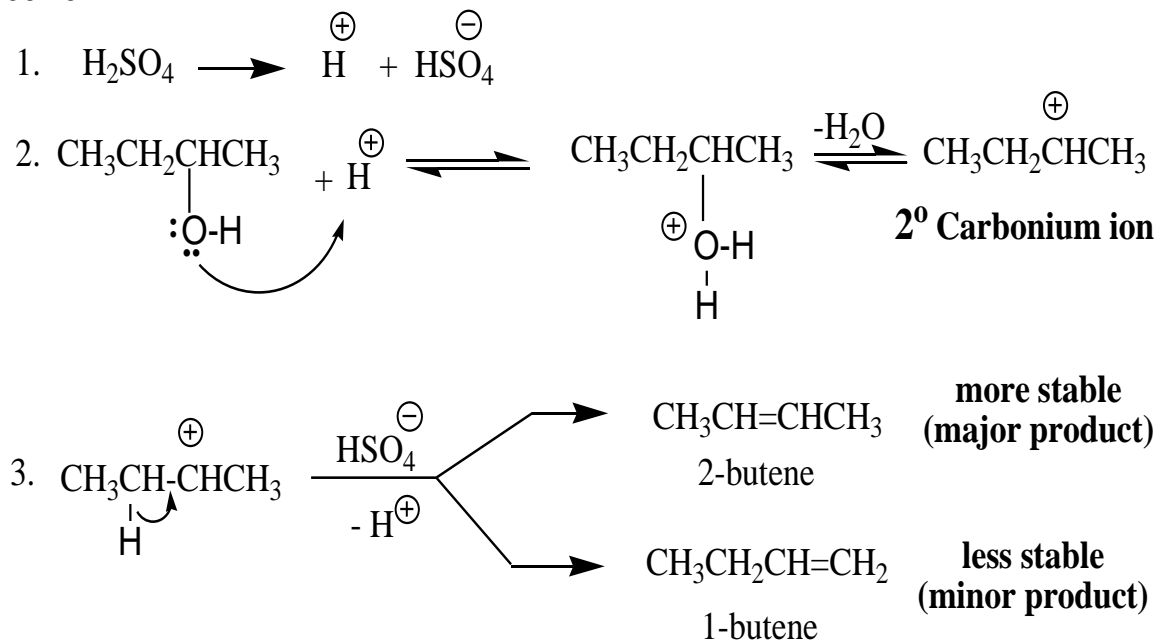


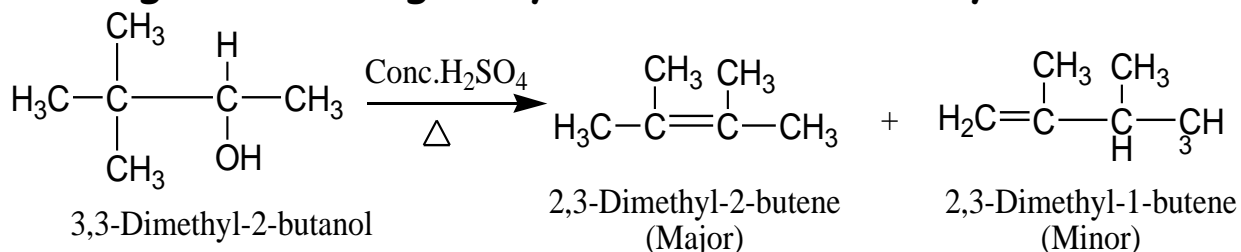
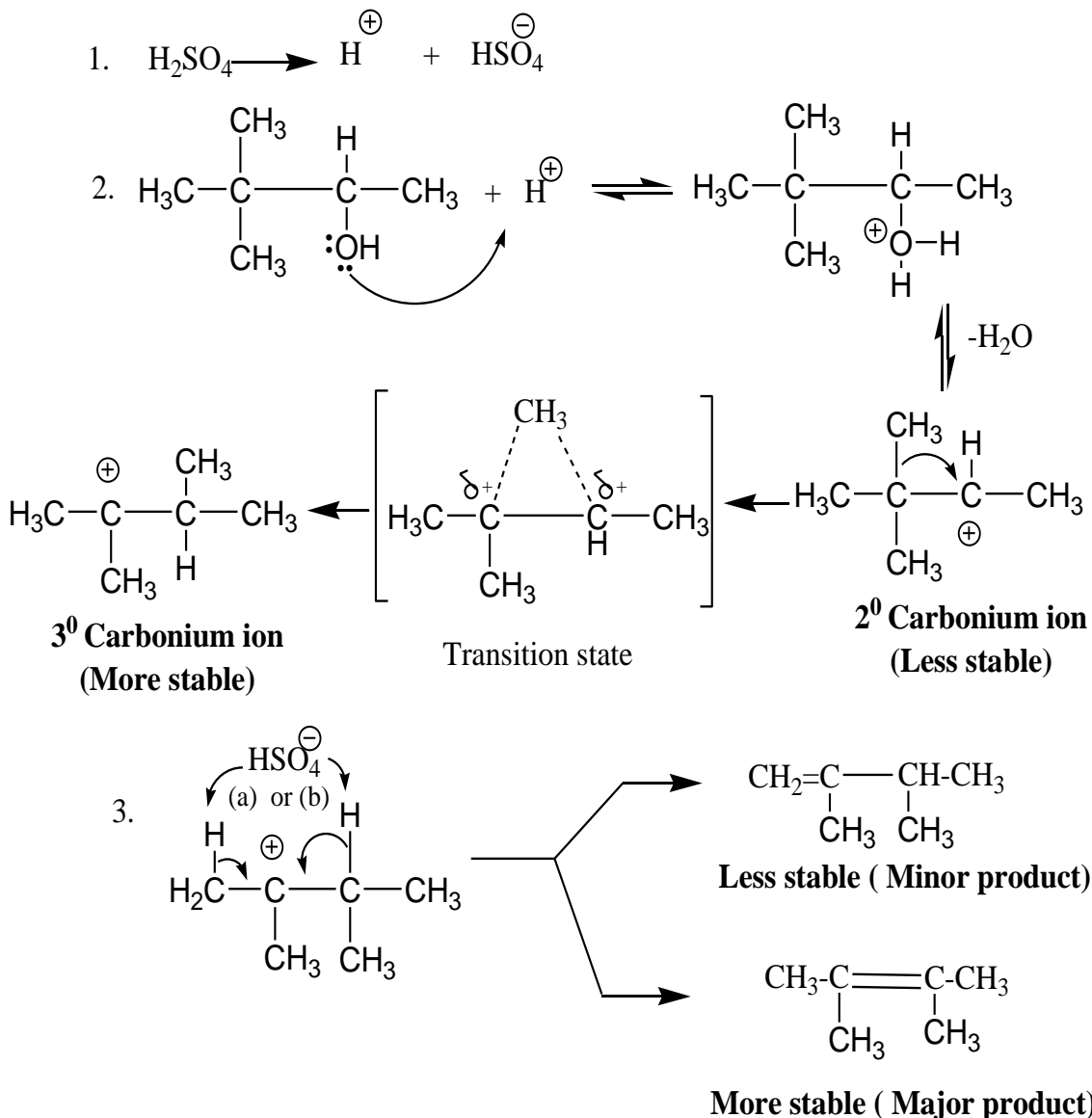
2-Dehydration of Alcohol (R-OH) (by Al₂O₃ at 300°C or heat with Conc.H₂SO₄).

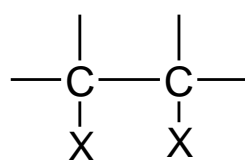
The ease of dehydration: $3^\circ > 2^\circ > 1^\circ > \text{CH}_3\text{OH}$



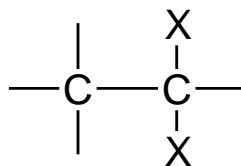
1°Alcohol**1°Alcohol****2°Alcohol****3°Alcohol**

The Mechanism for Dehydration of Alcohol:**1° Alcohol****2° Alcohol**

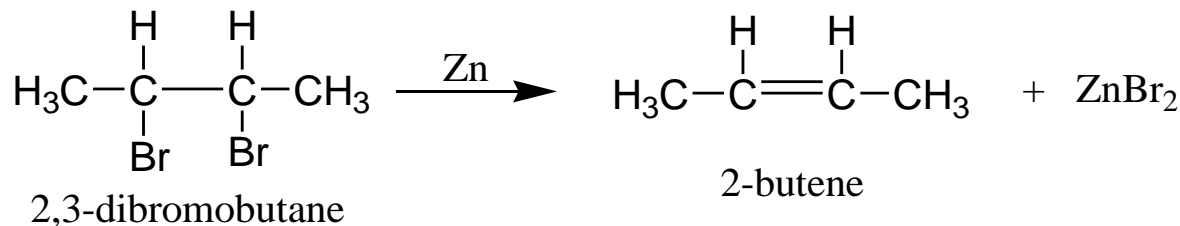
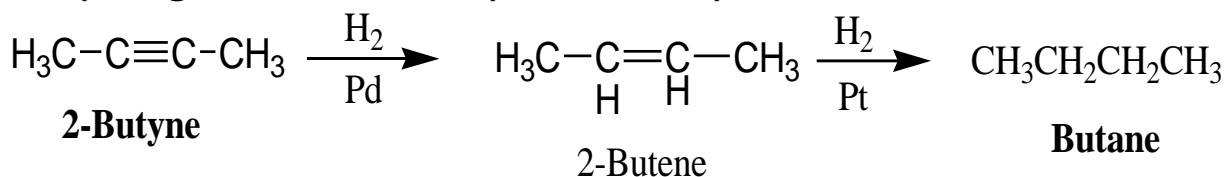
Rearrangement during Dehydration of Secondary Alcohols:**The Mechanism:**

3- Dehalogenation of Vicinal Dihalides (by Zn dust.Or NaI).

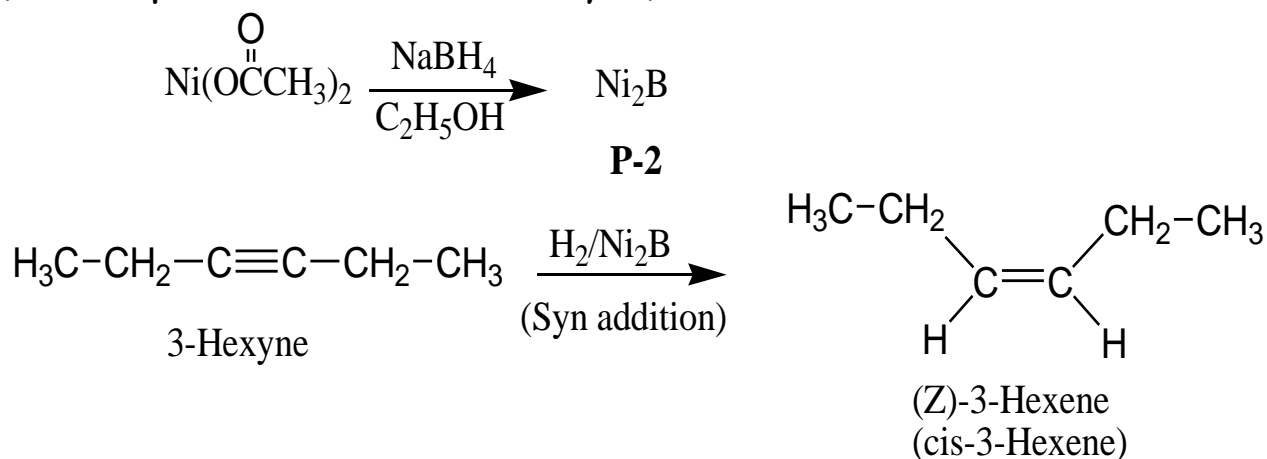
Avic-dihalide



A gem-dihalide

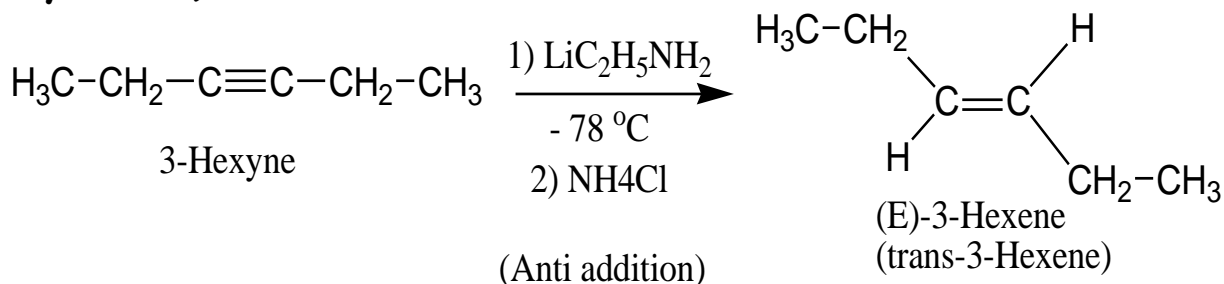
**4- Hydrogenation of Alkynes: (by H₂ / Pd).****Syn Addition of hydrogen:****Synthesis of cis-Alkenes (or Z-Alkene).**

(In the presence of P-2 catalyst)



Anti-addition of hydrogen:**Synthesis of trans-Alkenes (or E-Alkene).**

(In the presence of sodium or lithium metal in ammonia or ethylamine)

**5- Kolb's Synthesis:**

Electrolysis of the potassium salt of saturated dicarboxylic acids.

