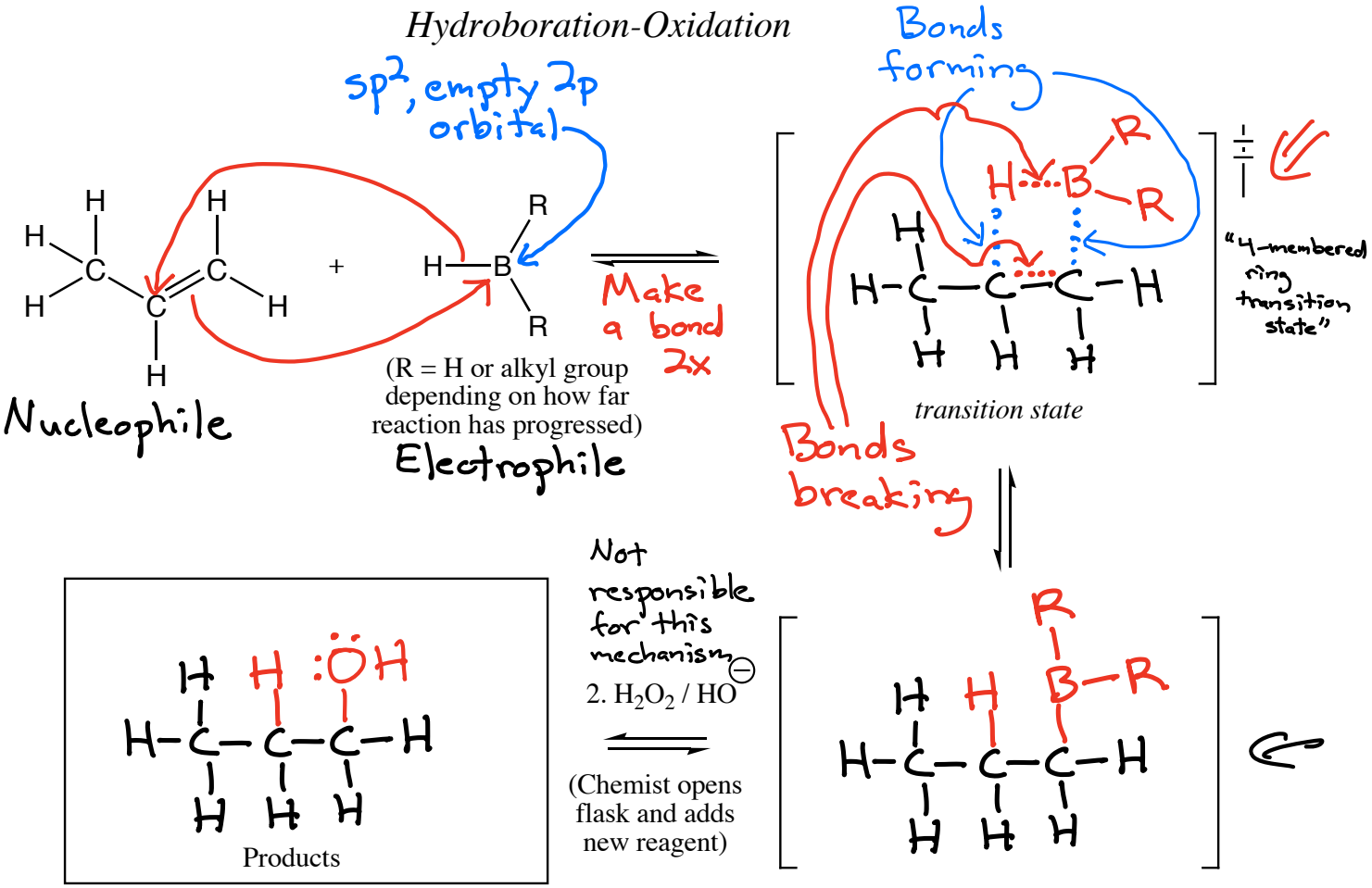
When you see

BH_3

Hydroboration-Oxidation

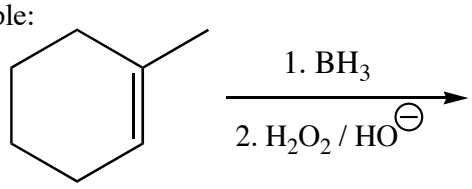


Summary: The pi bond of the alkene attacks the Lewis acid (electrophile) B atom at the same time a new bond forms between C and H. In 2nd step OH replaces B(R)2. "4-membered ring transition state"

Regiochemistry: Non-Markovnikov

Stereochemistry: Syn

Example:



When studying OChem → Call a NIRRS

Learn each of these things for every reaction → then you will be able to predict mechanisms and therefore products

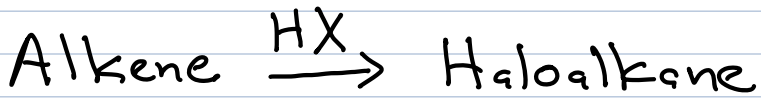
Nature of the reaction; what is the starting material/product? (i.e. alkene converted to an alcohol)

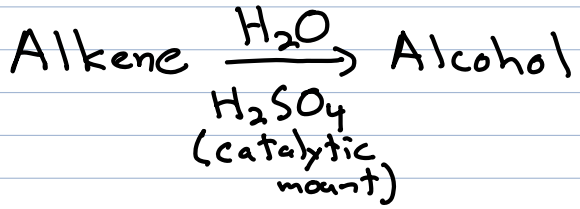
Intermediate (or "**I**mportant transition state" if applicable) of the reaction, the key to the mechanism (carbocation, halonium ion, etc.)

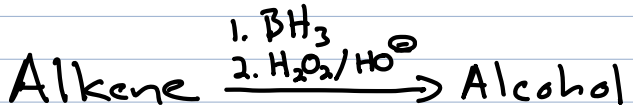
Reagents Learn the exact way to designate the reagents for each reaction

Regiochemistry What is the regiochemistry of addition? (Markovnikov, non-Markovinikov, etc.)

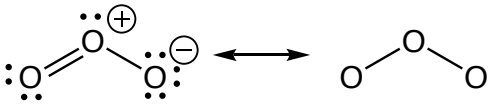
Stereochemistry of addition (anti, syn or mixed)



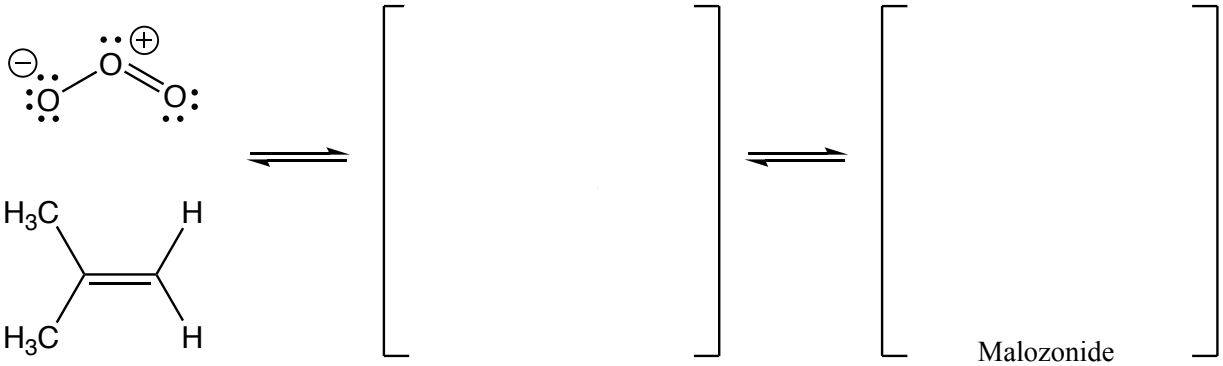




Ozonolysis Partial Mechanism



Ozone contributing structures

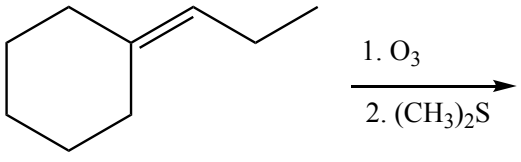


Summary:

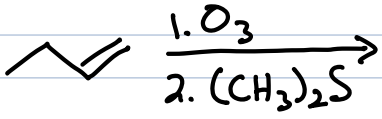
Regiochemistry:

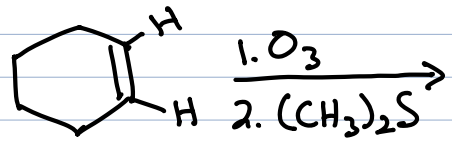
Stereochemistry:

Example:

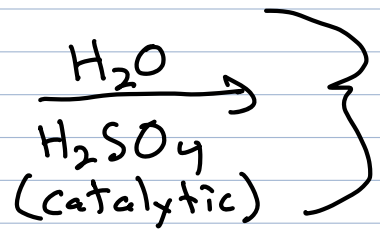


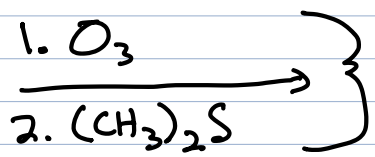
Ozonolysis is the only reaction that breaks C=C bonds!

1) 

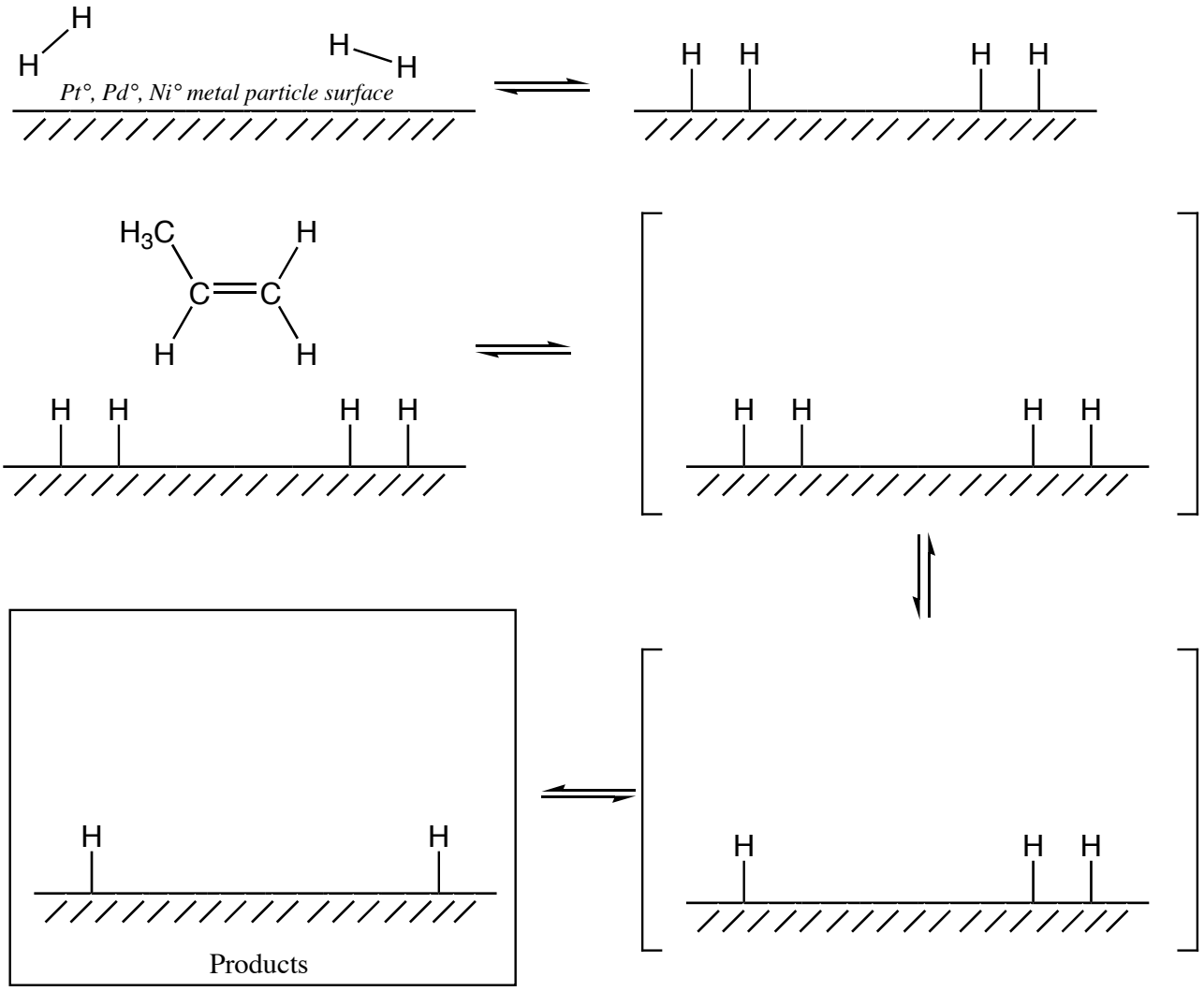
2) 

Notice the numbers!





Hydrogenation: H_2 with Pt°, Pd°, Ni°

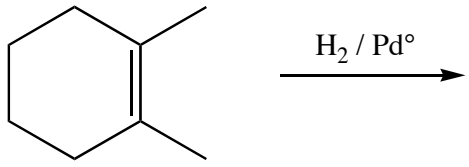


Summary:

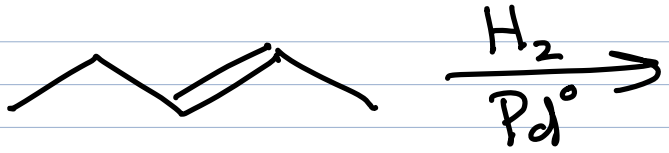
Regiochemistry:

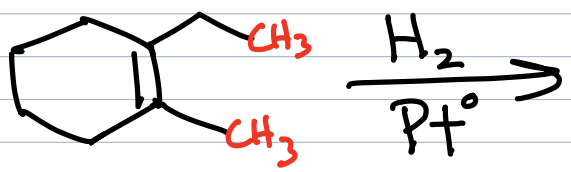
Stereochemistry:

Example:



Examples:

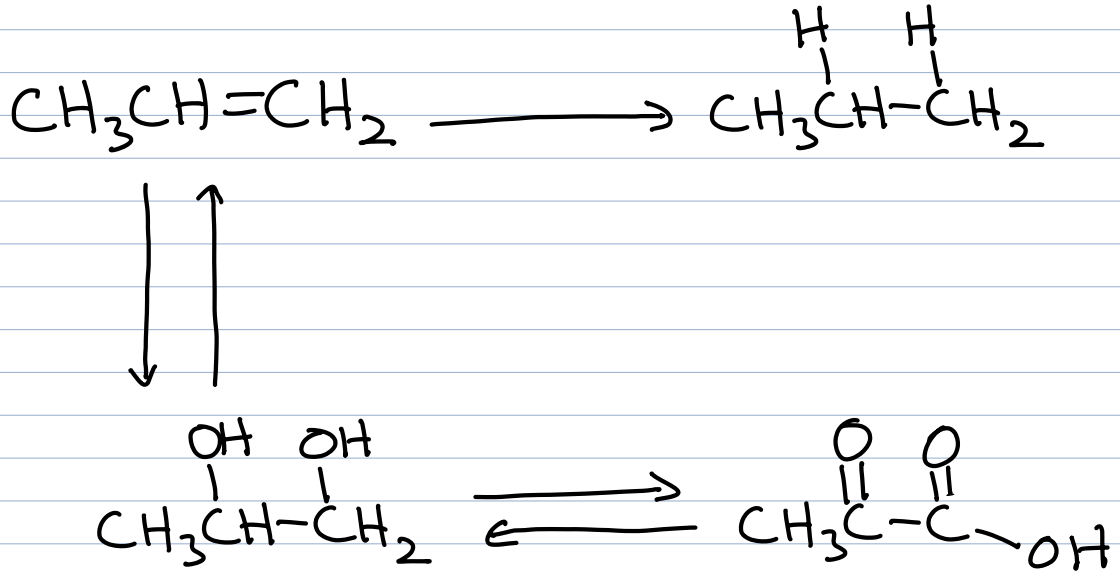




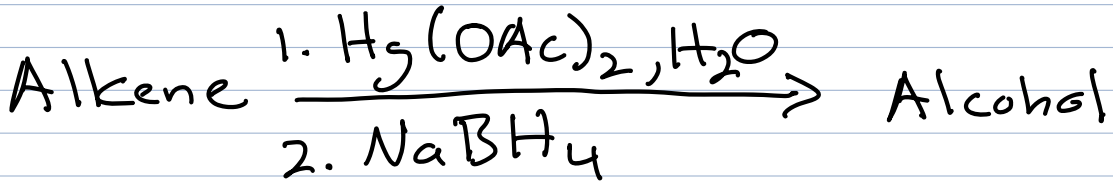
Important definitions for organic chemistry

Oxidation Reaction → Net loss of electrons

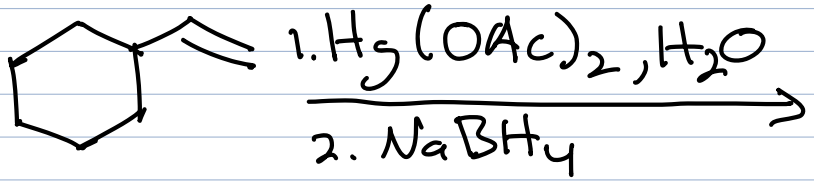
Reduction Reaction → Net gain of electrons



You do not need to know this next reaction, but I am going to show it to you for reference

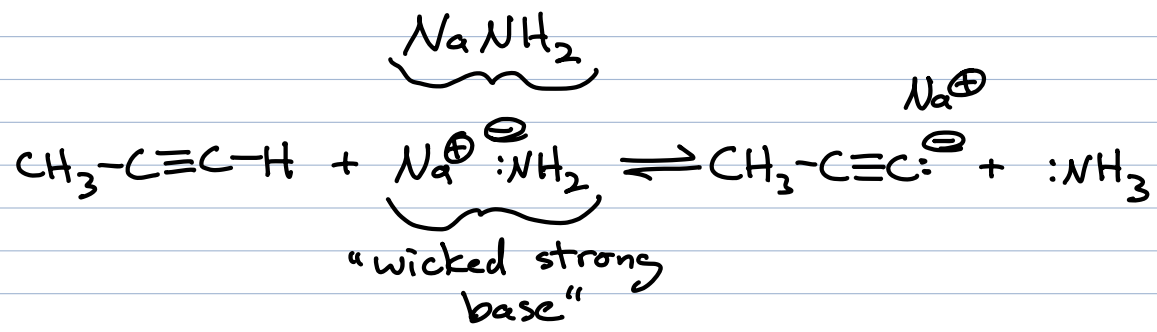


Example:



Alkynes → similar to alkenes because of the pi bonds.

→ One big difference

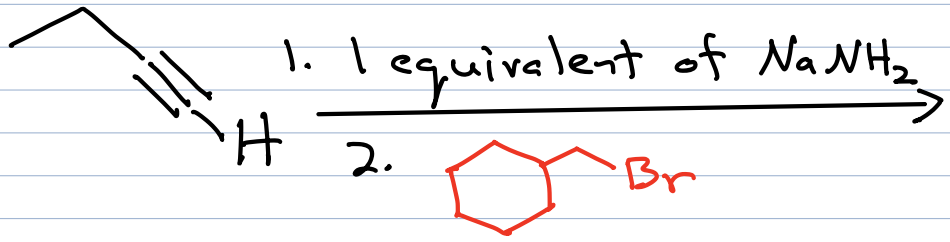


Epic New Reaction

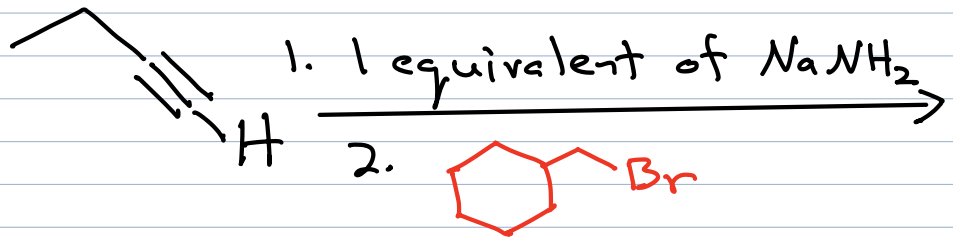
Time capsule: This is an S_N2 reaction. The haloalkane must be primary to avoid an E2 reaction.

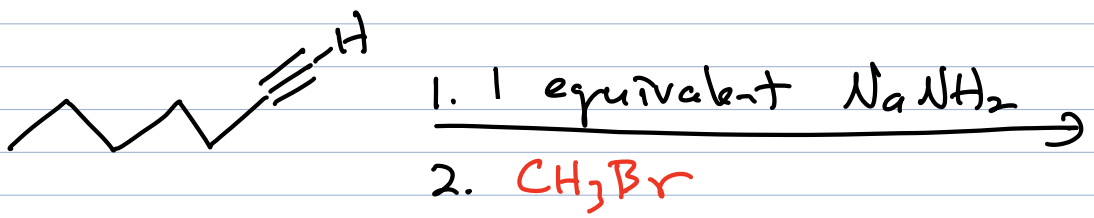
Making C-C bonds allows us to construct larger molecules from smaller ones!

Example:

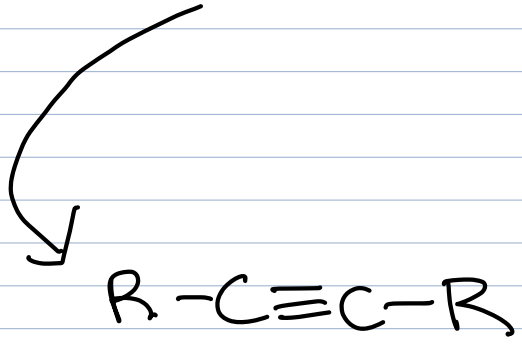


Example:



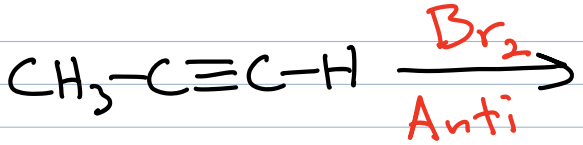


Alkynes ⇒ The two orthogonal pi bonds define alkyne reactions



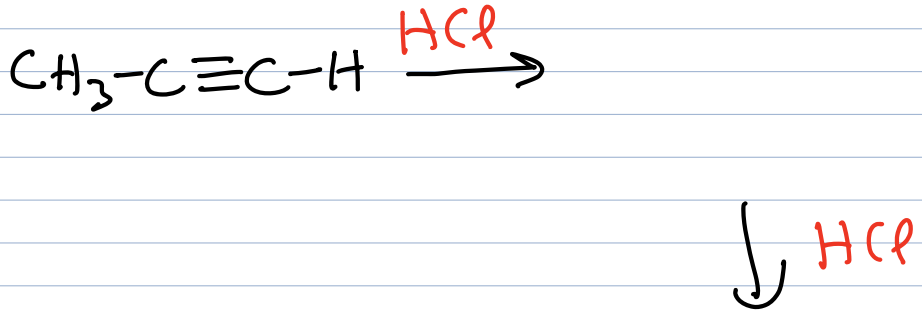
A) Reaction with 2 equivalents of X_2

X = Cl, Br

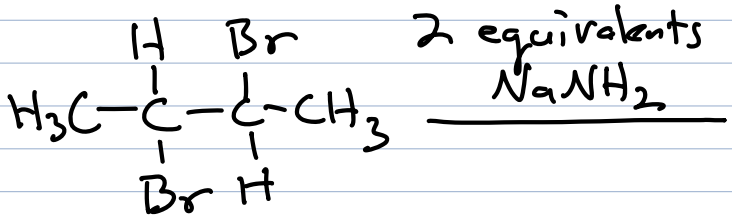


B) Reaction with 2 equivalents of H-X

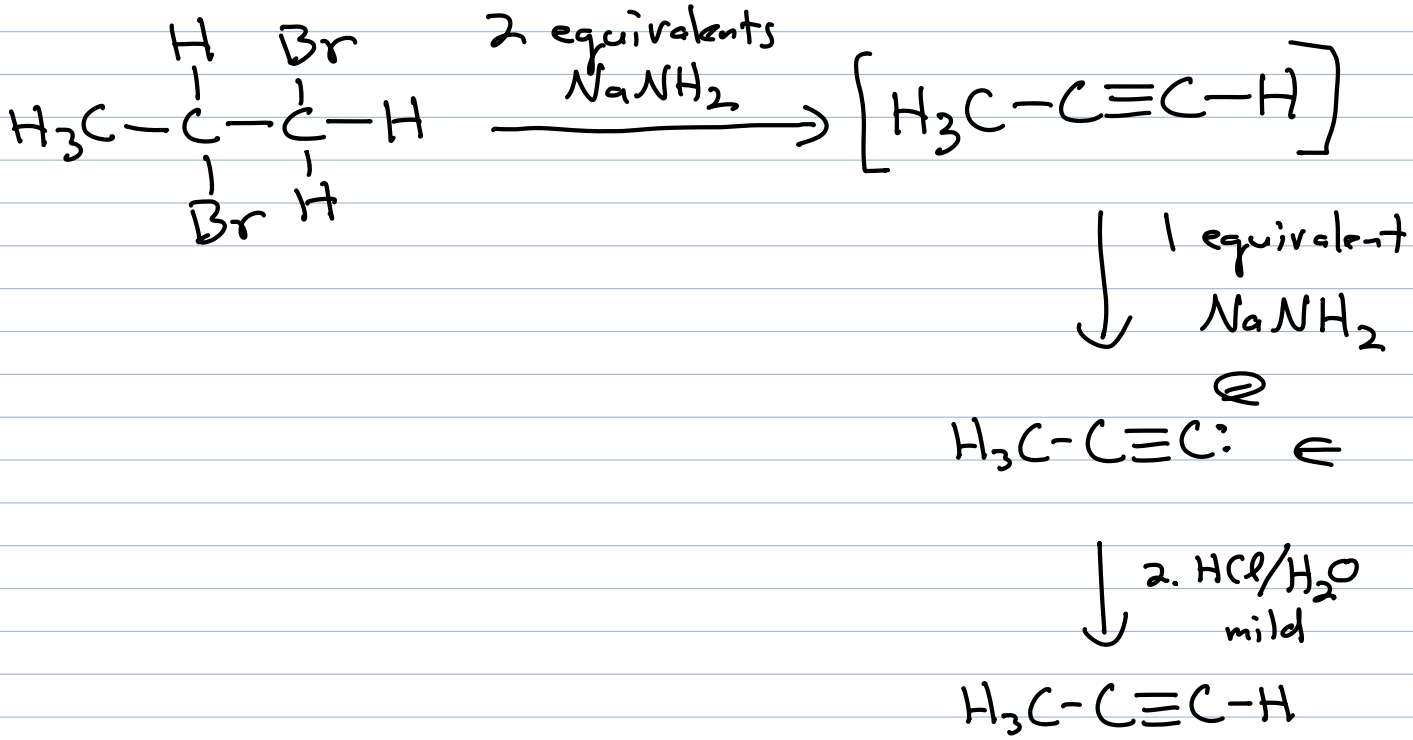
X = Cl, Br



c) Conversion of a vicinal dihalide into an alkyne

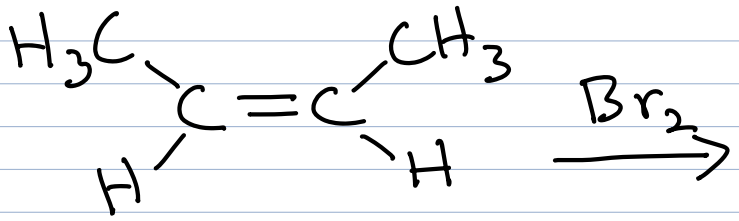


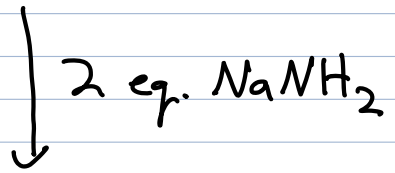
Time capsule → This is a double E2 reaction

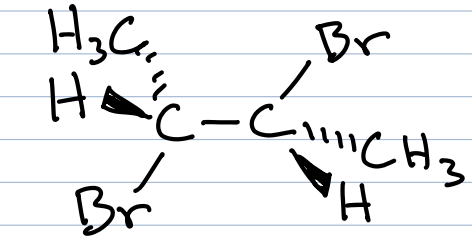


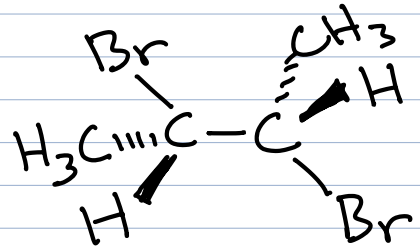
$CH_3-CHBr-CHBr-CH_3 \xrightarrow{2\ eq.\ NaNH_2}$

Big Deal → allows conversion of an alkane to an alkyne



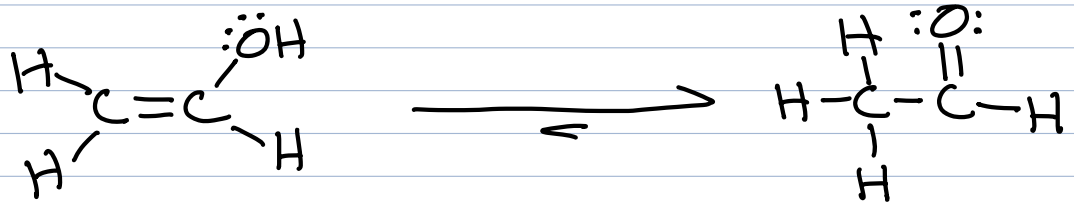


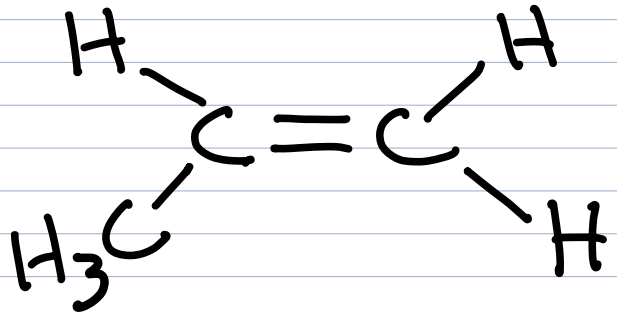


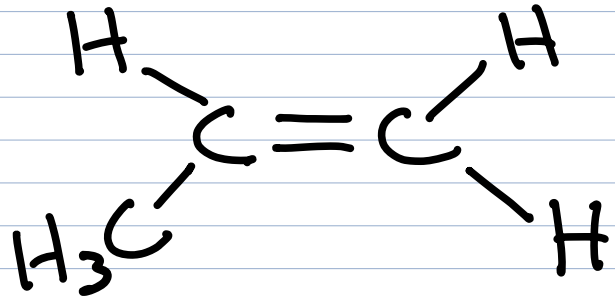


Racemic

New Concept → The following species are in equilibrium, and the more stable species is the form





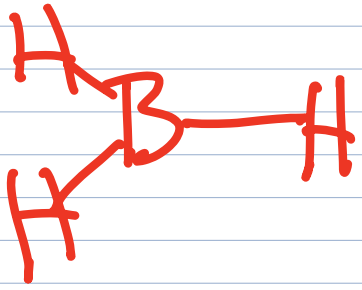


$H_3C-C\equiv C-H$

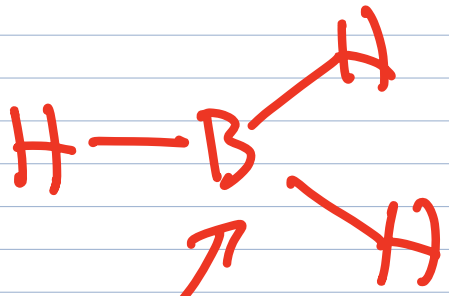
$H_3C-C\equiv C-H$

$H_3C-C\equiv C-H$

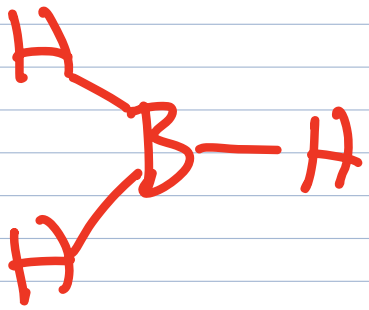
$H_3C-C\equiv C-H$

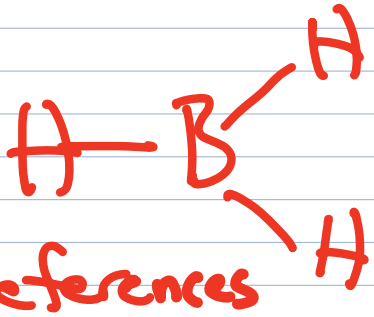


steric strain

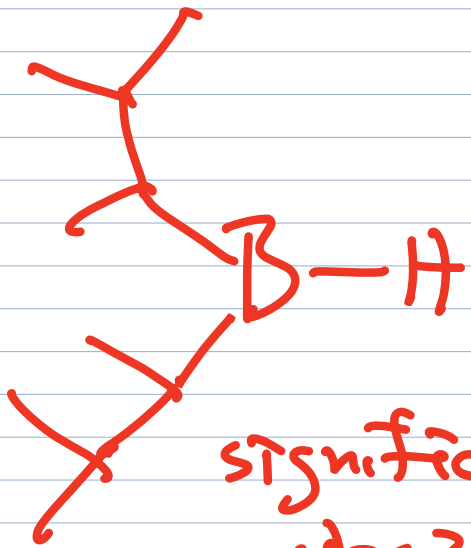


Little steric strain

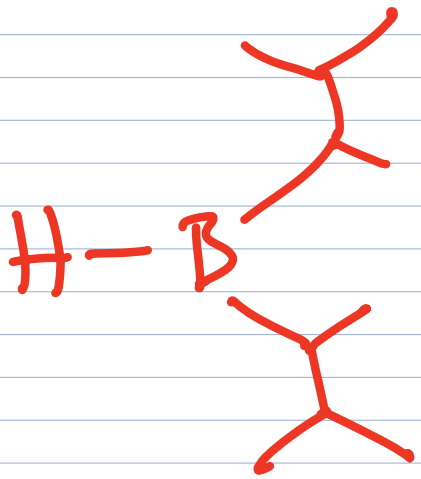




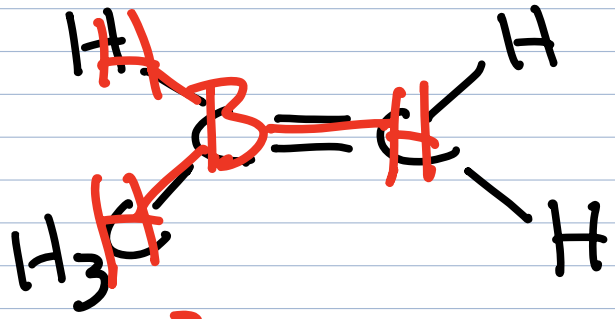
No real preferences



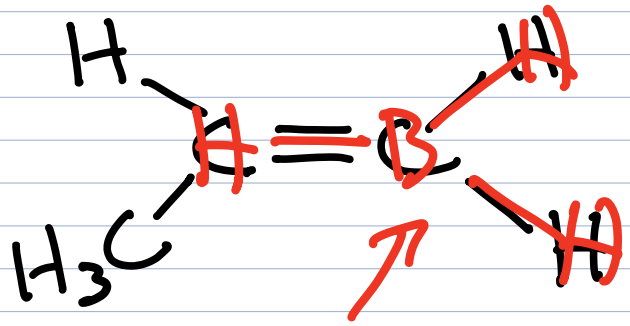
significant steric strain



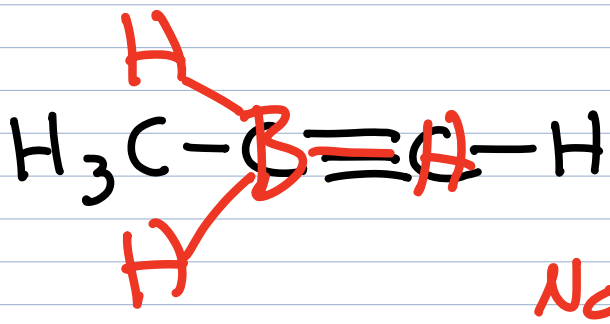
Highly Preferred

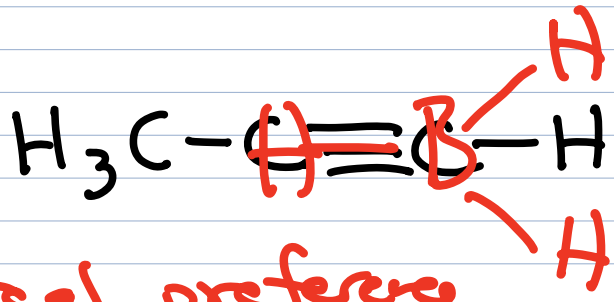


steric strain

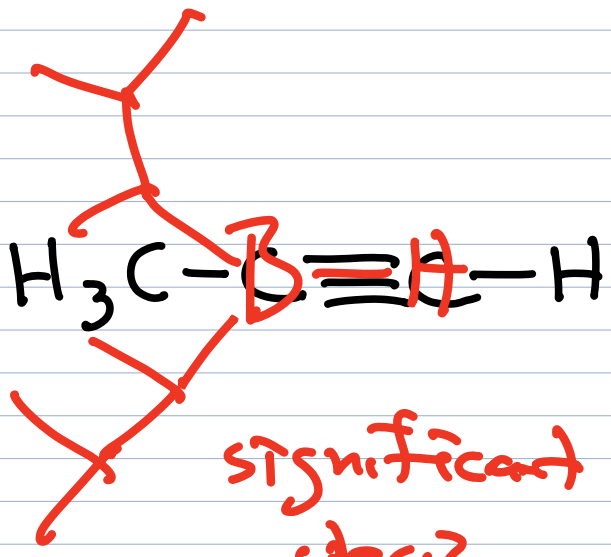


Little steric strain

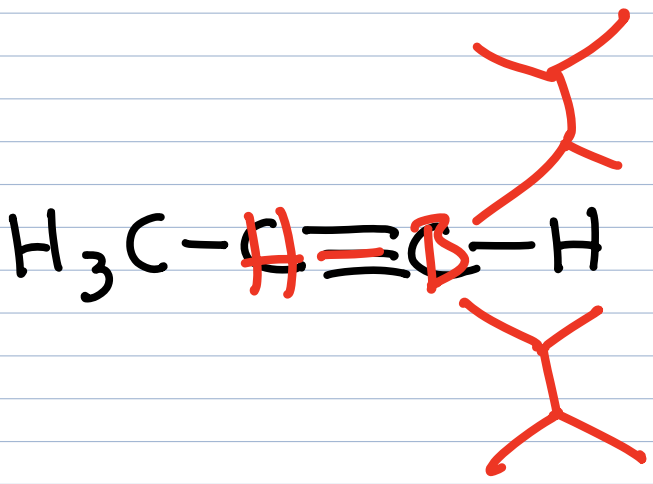




No real preference

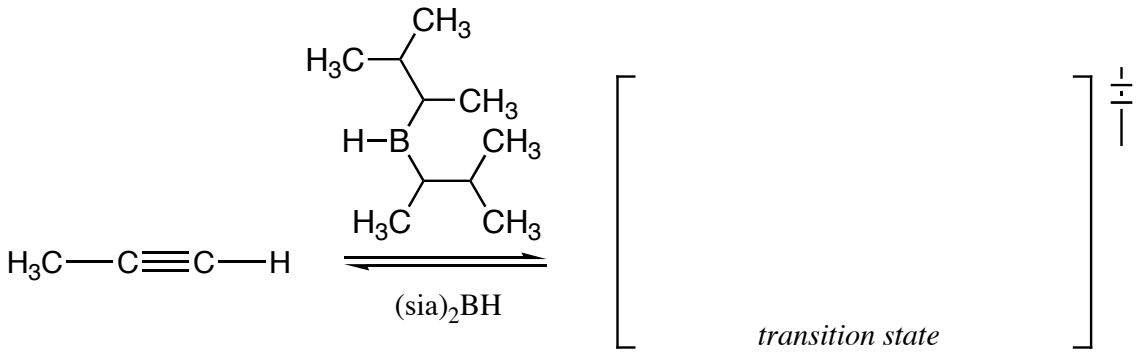


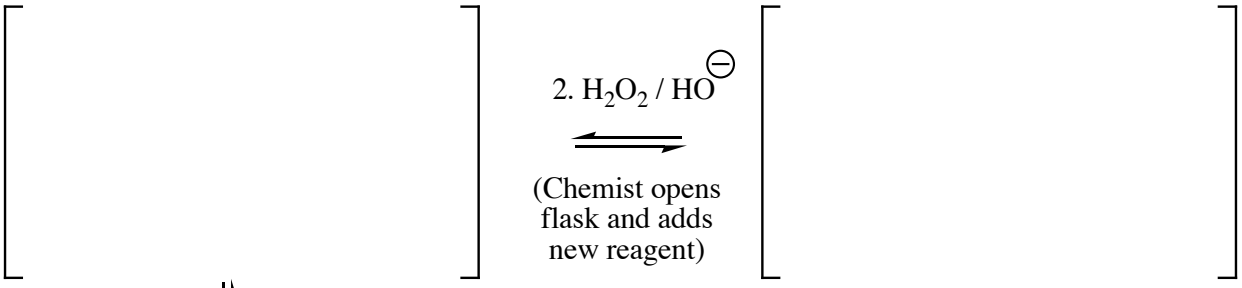
significant steric strain



Highly Preferred

Terminal Alkyne Hydroboration





Keto-enol tautomerization

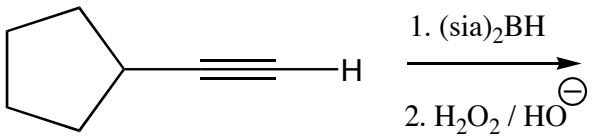
Products

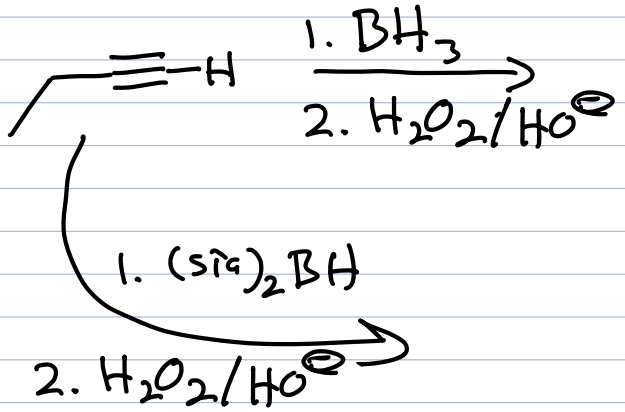
Summary:

Regiochemistry:

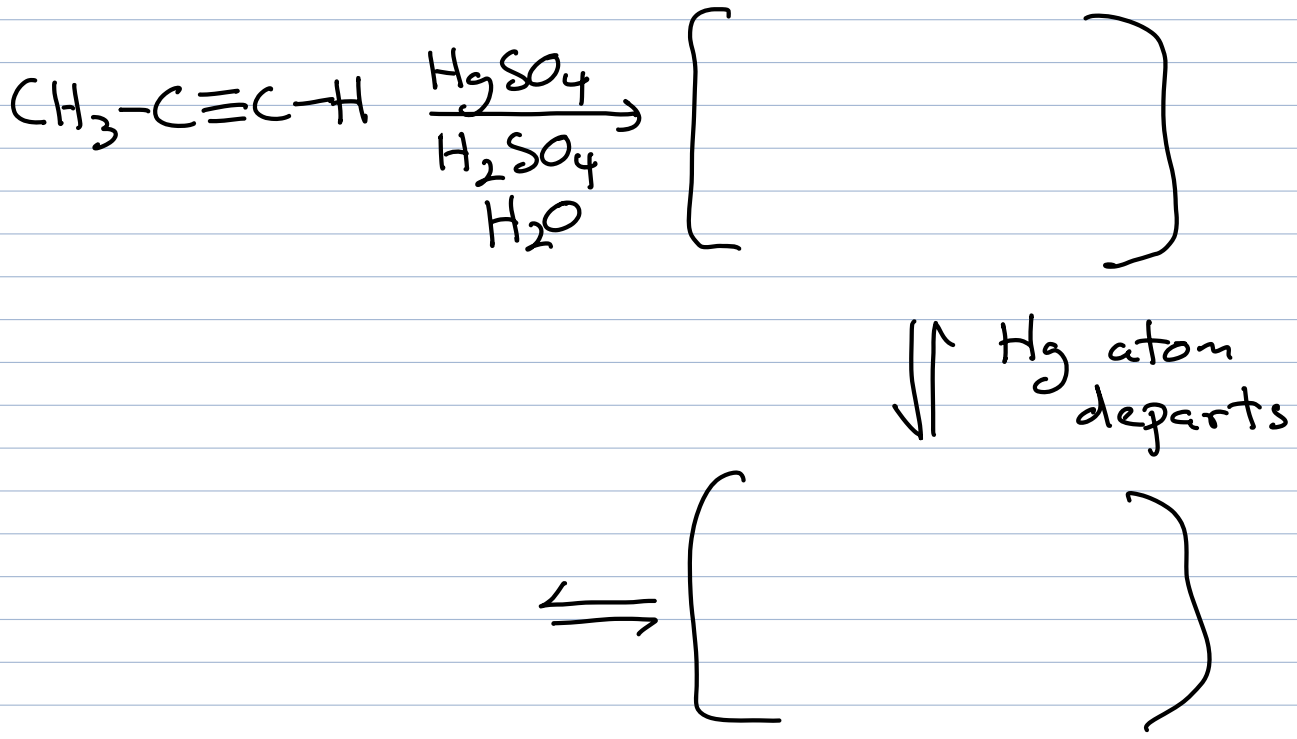
Stereochemistry:

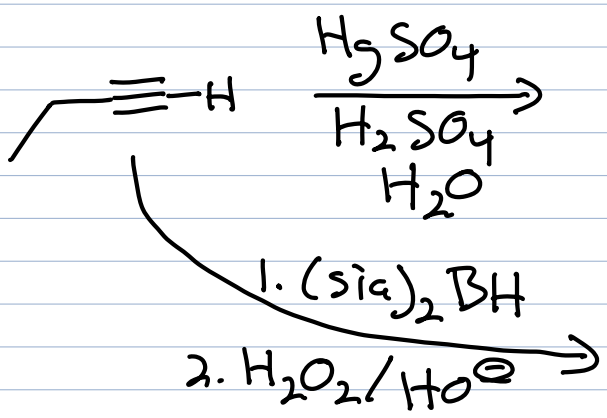
Example:




1. BH_3
2. $H_2O_2/HO^{\ominus}$
1. $(sia)_2BH$
2. $H_2O_2/HO^{\ominus}$

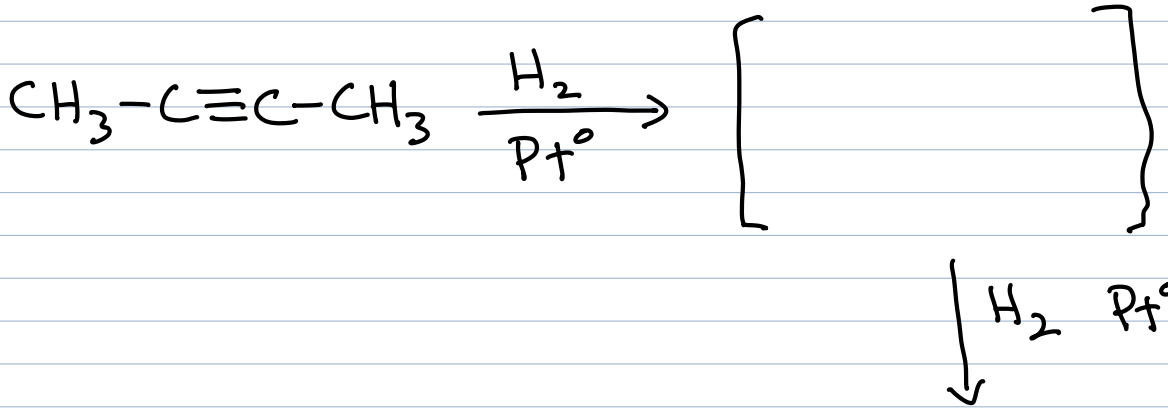
Hydration of an alkyne using $HgSO_4$, H_2SO_4, H_2O



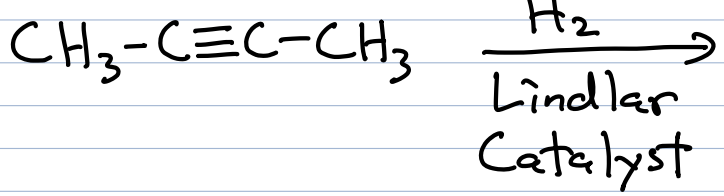


Reduction of Alkynes

1) Hydrogenation H_2 $Pt^\circ, Pd^\circ, Ni^\circ$

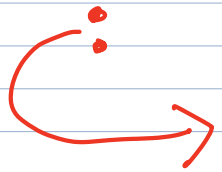


Lindlar Catalyst → special catalyst that stops the hydrogenation at the syn addition



Time Out:

Regular Arrows



"Fish hook" Arrows

Radical → a species with an electron

Time In:

2) Dissolving metal reductions of alkynes

Na^0 in NH_3

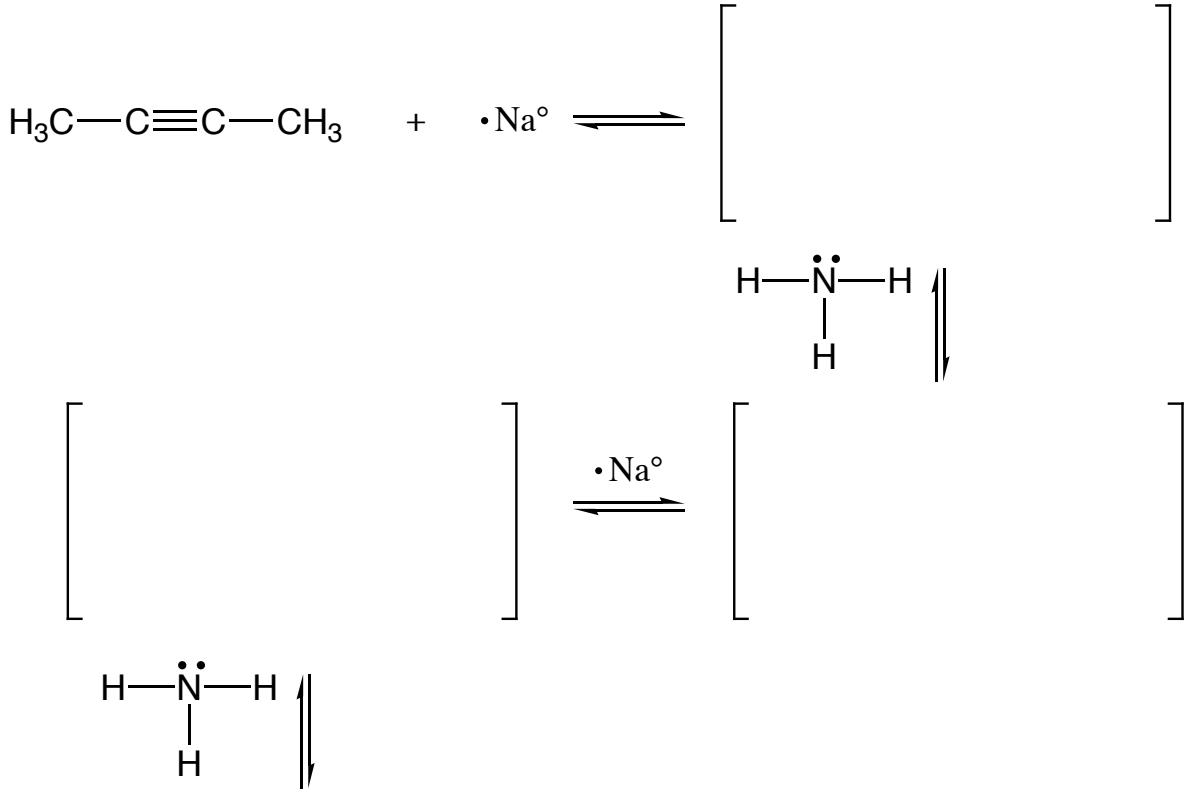
Sodium → (Na^0) is a very strong agent

because $Na^{\oplus}$ has a

in its valence shell

NH_3 → used as and the source of

Reduction of Alkynes Using Sodium and Ammonia



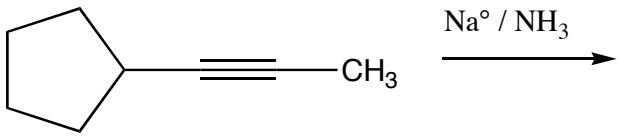
Products

Summary:

Regiochemistry:

Stereochemistry:

Example:



Reductions of alkynes → 3 choices