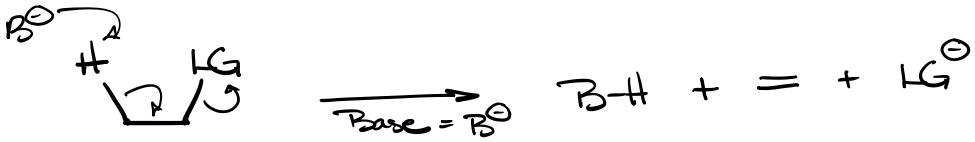
Previously S_N1 & S_N2 substitution Rxns

Today E_1 & E_2 elimination Rxns



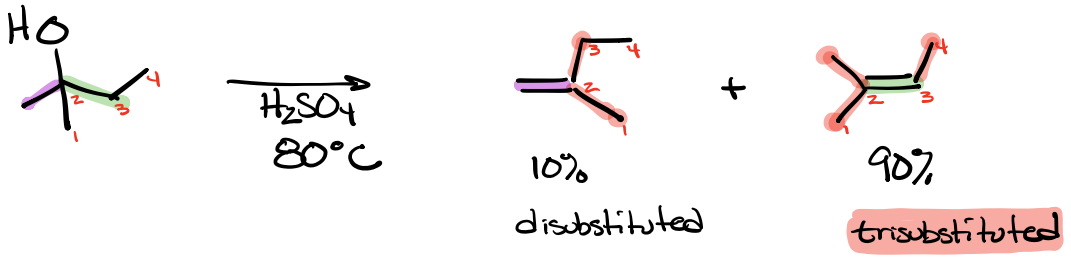
Regioselective & Stereoselective

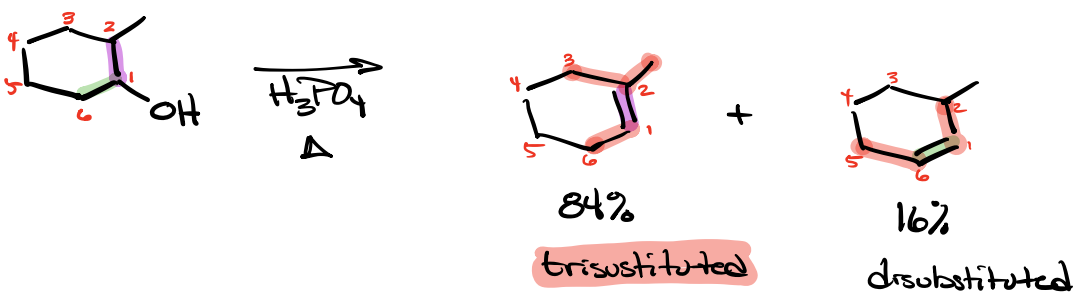
Regioselective = Location of double bond

Stereoselective = Cis vs. trans (als S vs. R

Dehydration 

Regioselective

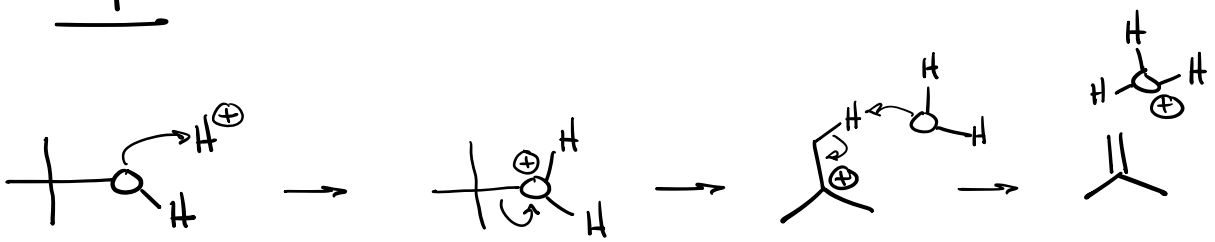


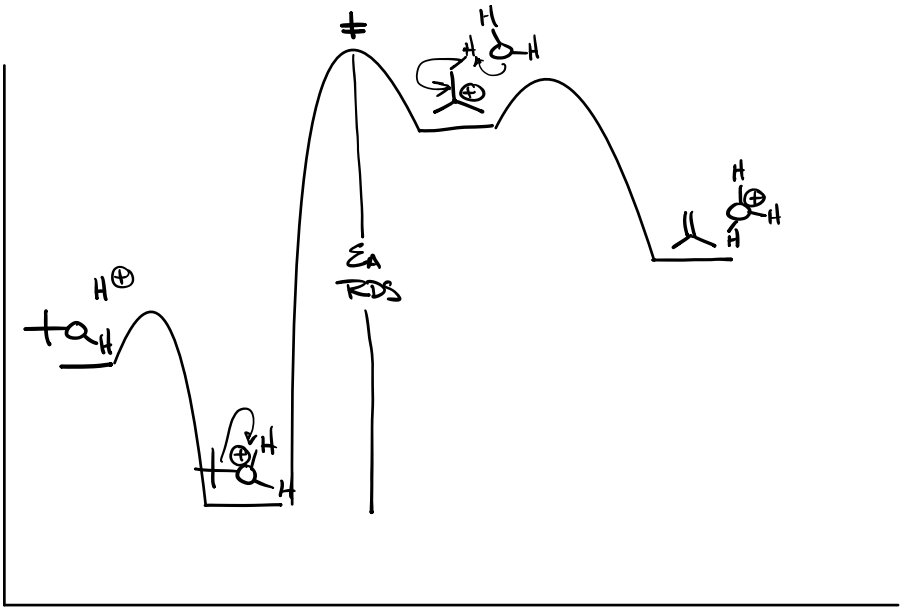


Zaitsev's Rule (1875) Alexande Zaitsev

The more substituted double bond will be the major product.

E_1 Elimination 1st Order



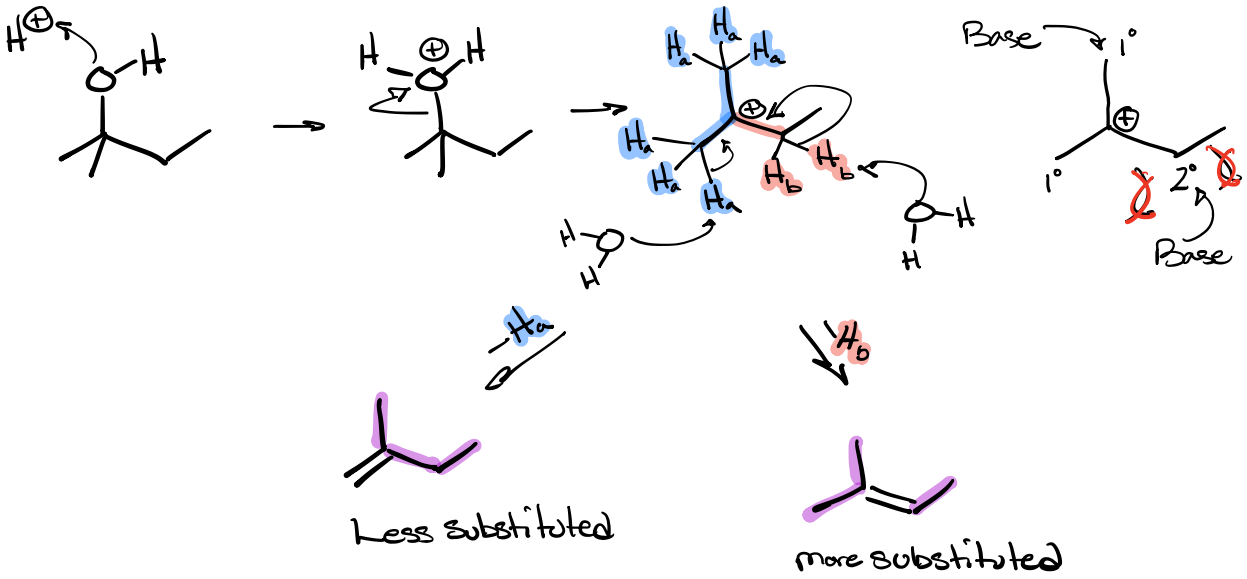


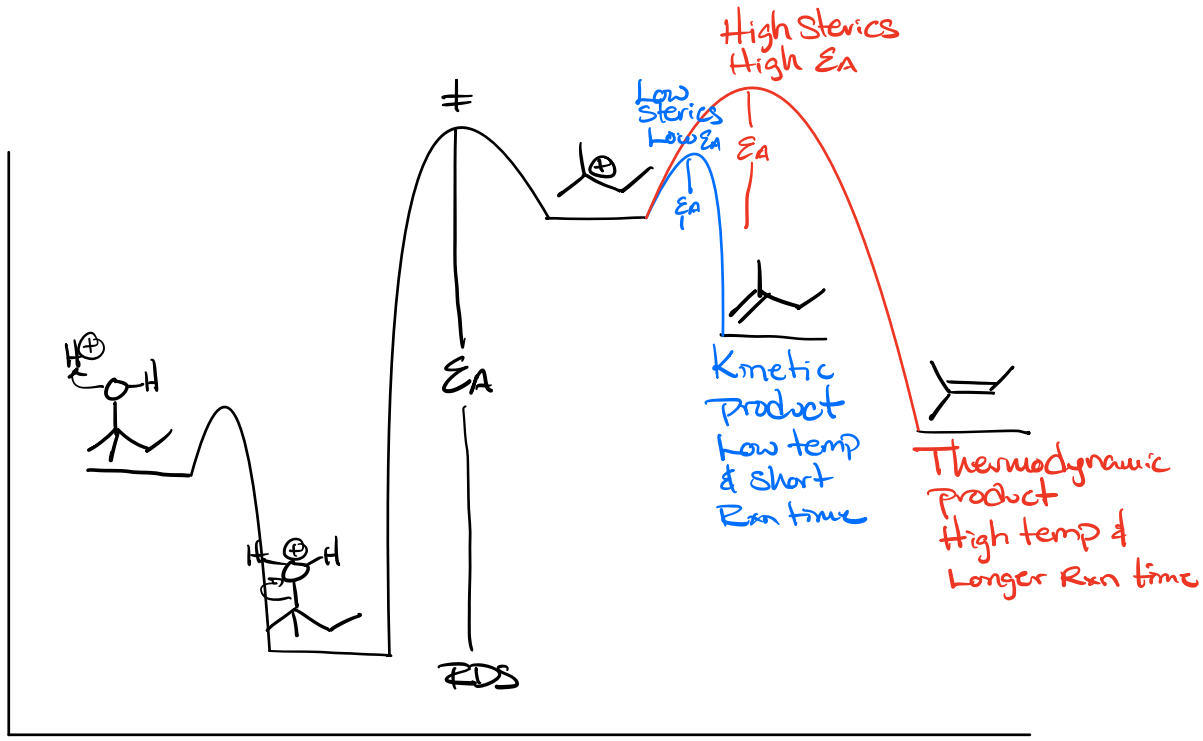
Endothermic overall

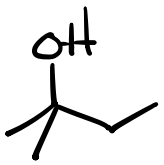
Rate E_1 = $k[R\text{-}LG]$ Reminder: Rate S_N1 = $k[R\text{-}LG]$

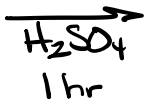
Same factors apply as for S_N1

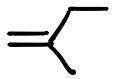
$Rate_{substrate}$ $3^\circ >> 2^\circ > 1^\circ$

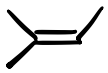

Base
1°
1°
2°
Base
Less substituted
more substituted


High Sterics
High EA
Low Sterics
Low EA
EA
EA
EA
RDS
Kinetic product
Low temp & Short Rxn time
Thermodynamic product
High temp & Longer Rxn time



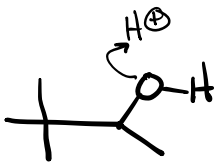


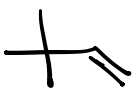

kinetic

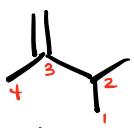

thermo

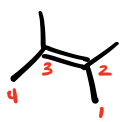
Temp 80°C 10% 90% High temp Thermo

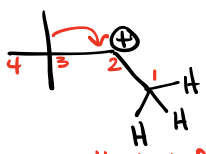
30°C 60% 40% Low temp kinetic

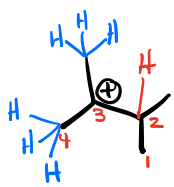


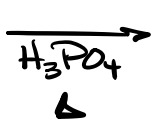

monosub
3%


disub
33%


tetrasub
64%


1,2-alkyl Shift
2° C^+


3° C^+



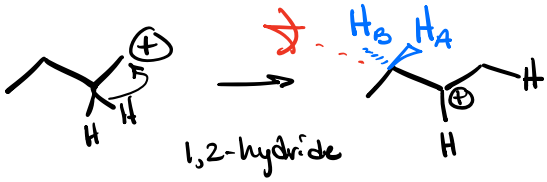

12%
monosub

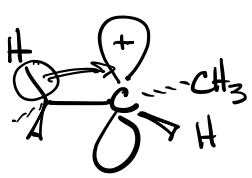

trans
56%

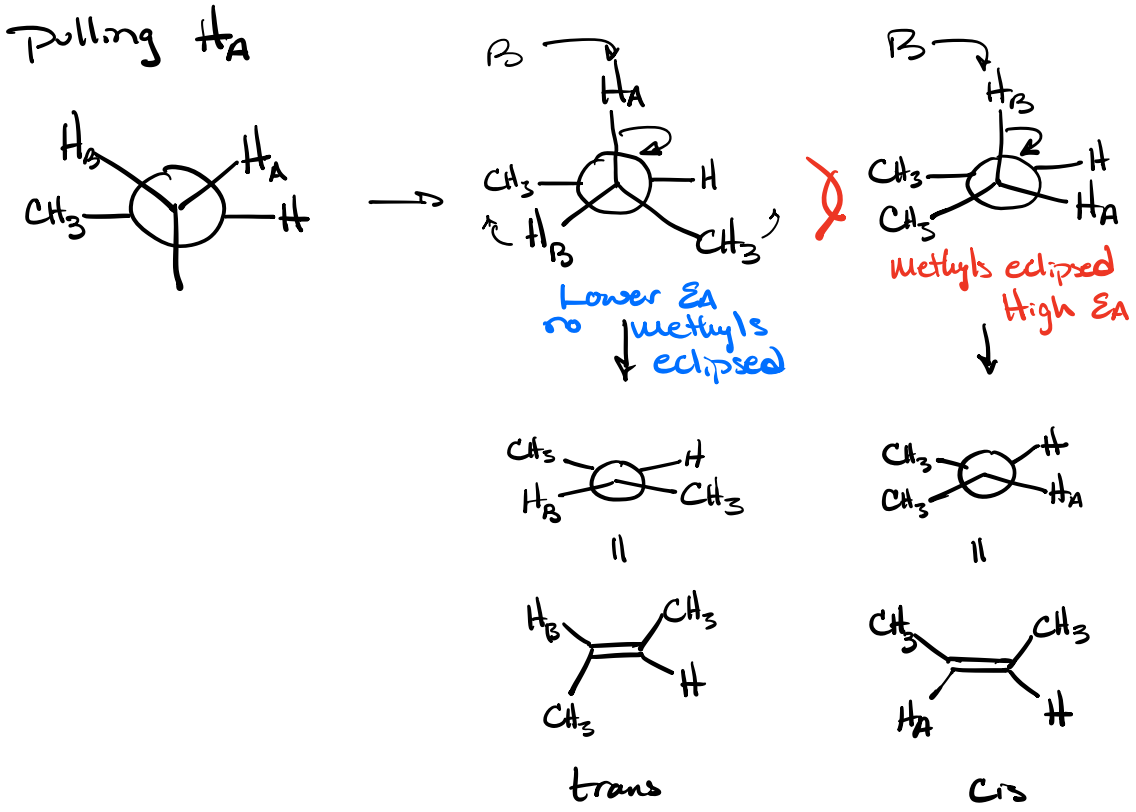

cis
32%

Disub 88%

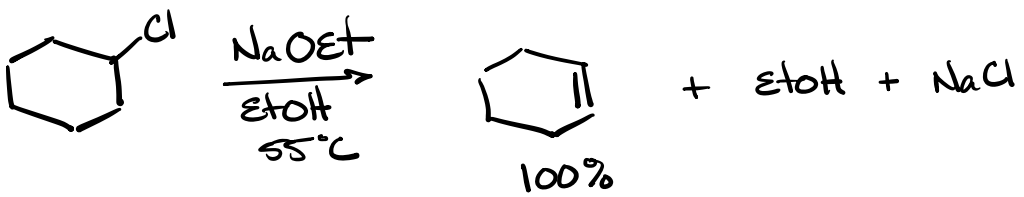
Why more trans than Cis?

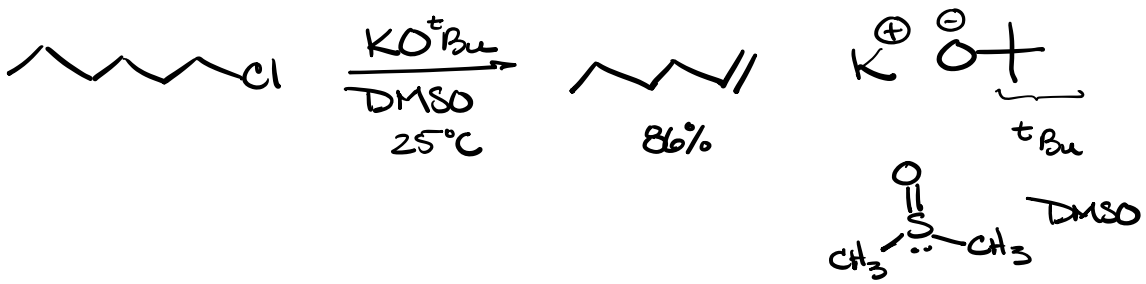


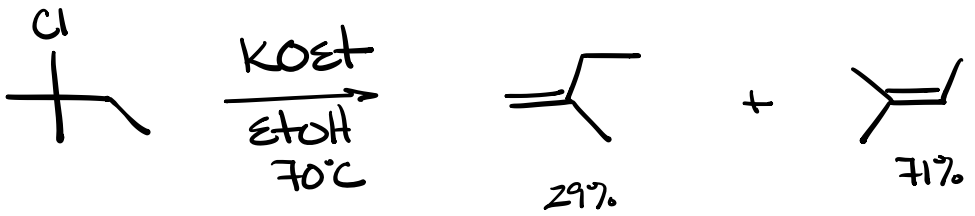


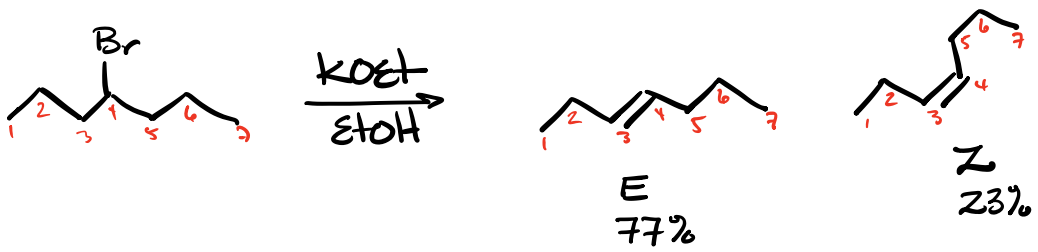


Dehydrohalogenation

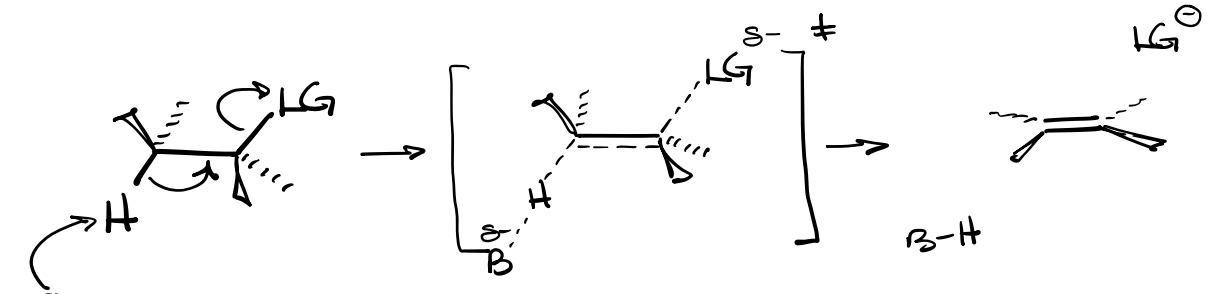


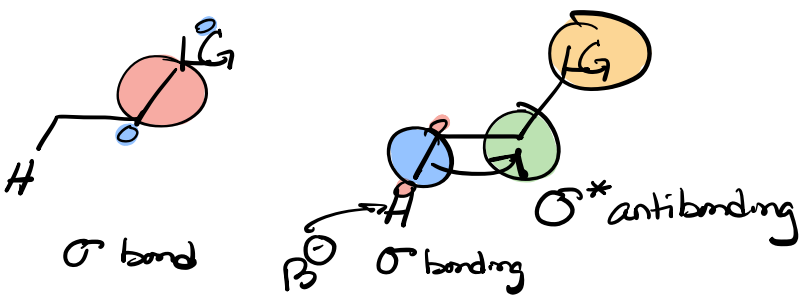


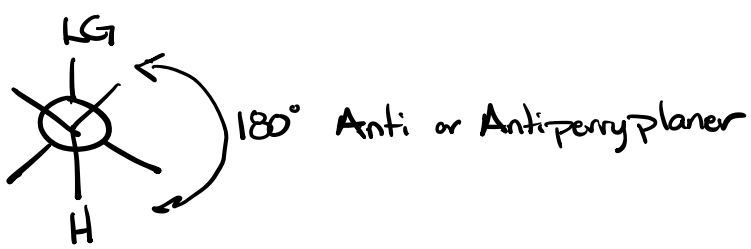


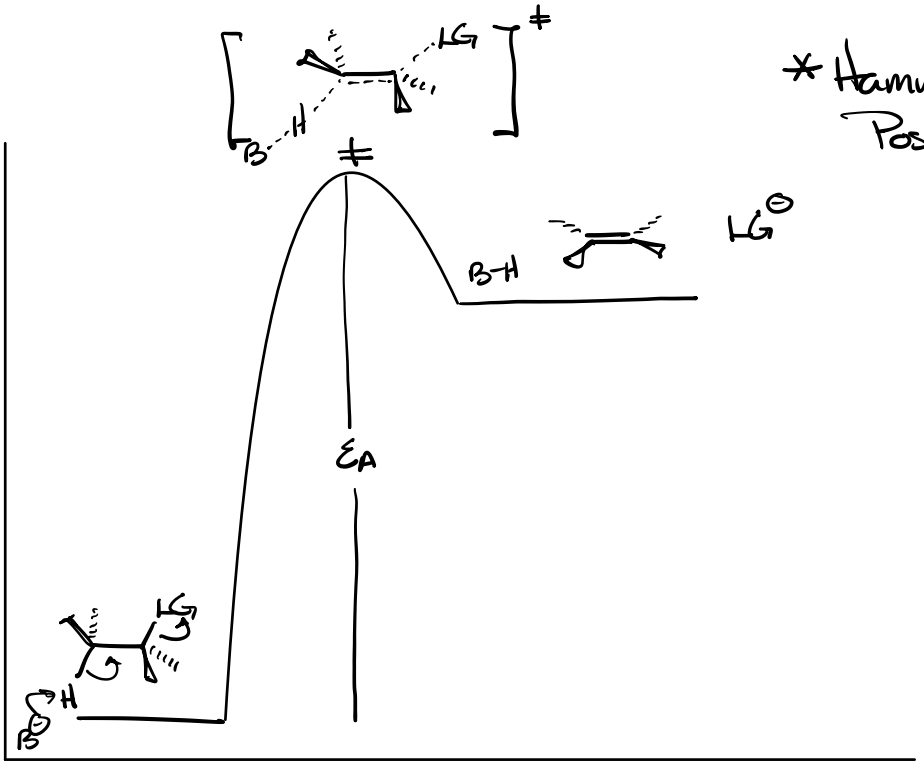


E_2 - Elimination 2nd order









* Hammond Postulate

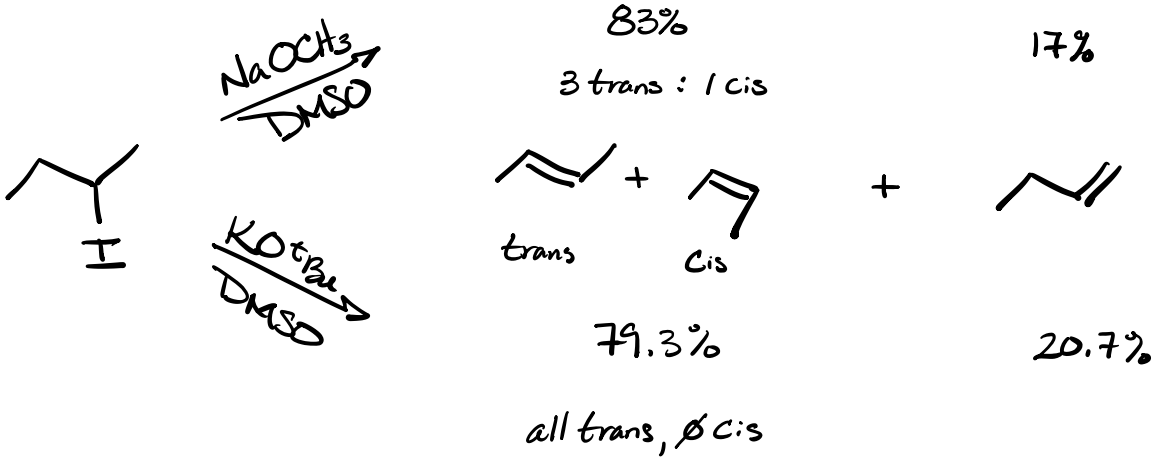
Rate E_2 = k[R-LG][Base]

Reminder S_N2 Rate = k[R-LG][nuc]

$Rate_{substrate}$ 3° >> 2° > 1°

‡ → product like

E_A governered by the structure of product



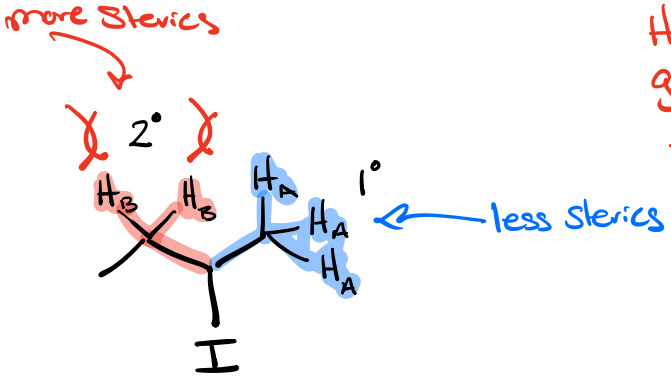
NaOMe

$NaOCH_3$

Sodium Methoxide

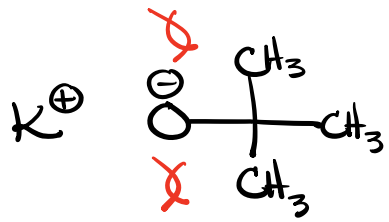
Small Base

Easier at getting into tighter Spaces



KO^tBu

Potassium tert-butoxide



Sterically bulky base

"Bulky Base"

Has difficult time getting into small tight spaces