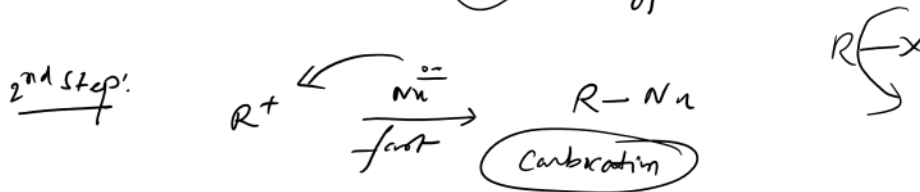


Nucleophilic Substitution:

SN1 (1 → molecularity)

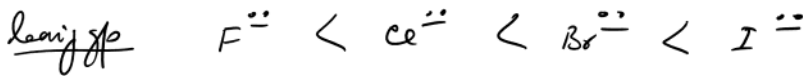
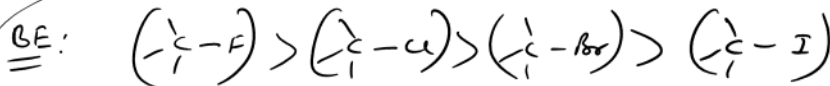
Two step process



Rate of SN1:

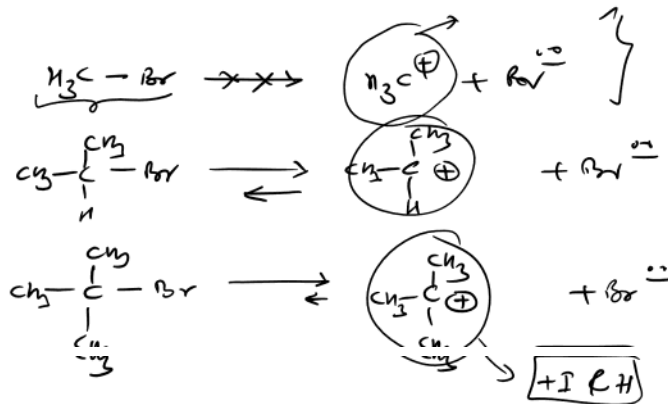
does not depend on nucleophile.

Better leaving gp (a weaker base is better leaving gp)



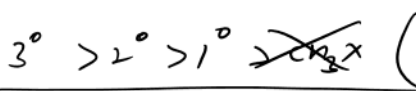
rate

for a given R- (alkyl) in R-X

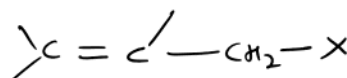


CH_3-X never goes for self ionization even with best leaving gp

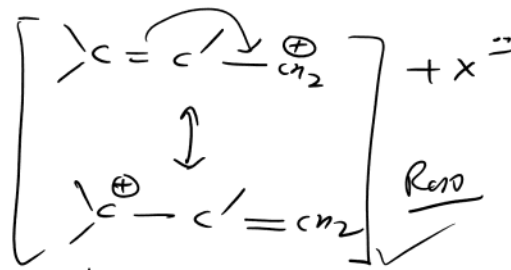
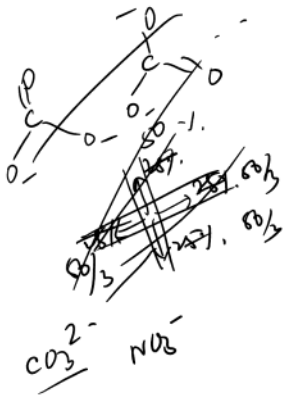
rate!



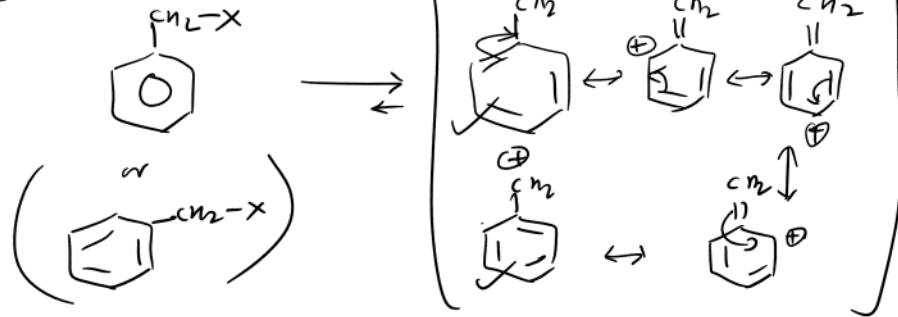
Allylic



goes for self ionization



Benzylic



rate for SN1

Benzylic > Allylic > 3° > 2° > 1°

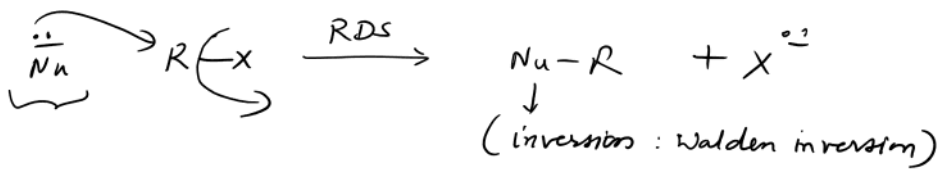
SN2

(molecularity = 2)

Single step process.

Transition state mechanism (no intermediate is formed)

Bond breaking & bond formation takes place simultaneously.

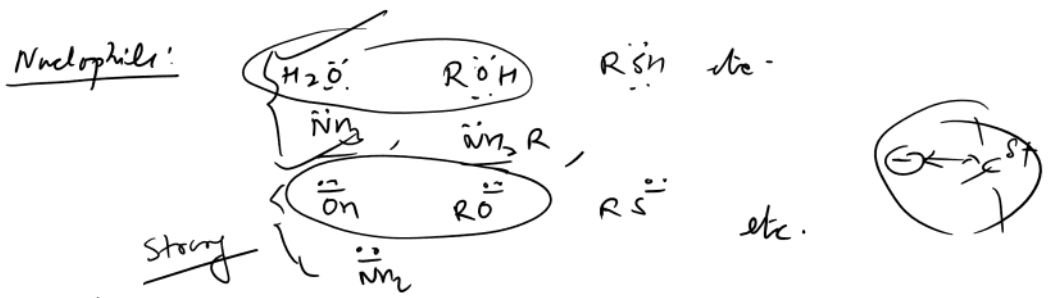


Rate for SN2 is highly sensitive to steric hindrance @ nucleophilic site ($\text{C}^{\oplus}\text{X}^{\ominus}$)

Rate:

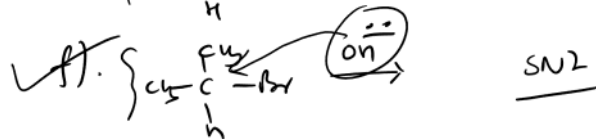
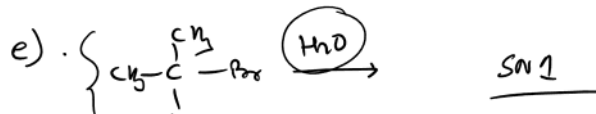
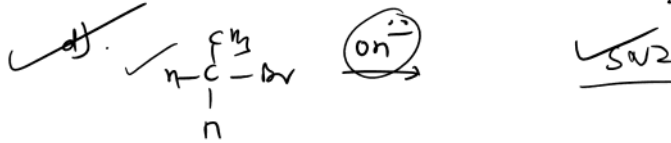
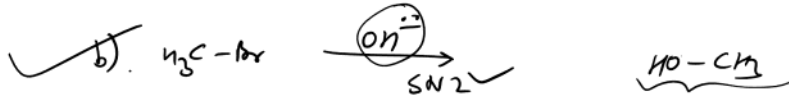
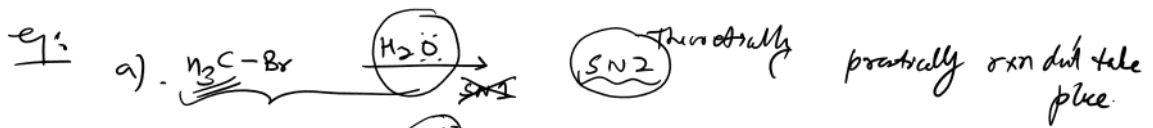
3° < 2° < 1°



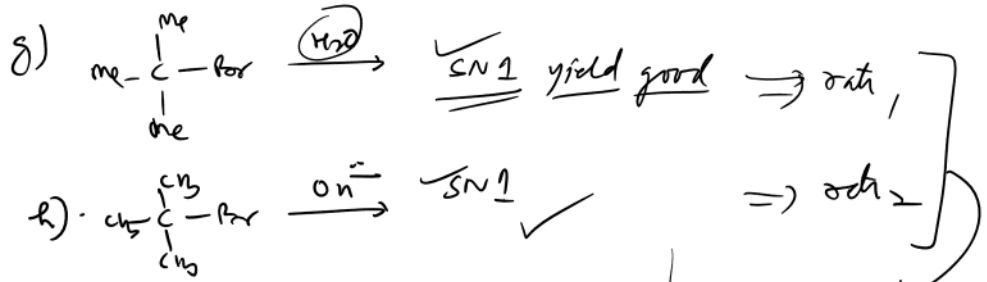


↳ all neutral nucleophiles are weak nucleophile
except ammonia and ammonia derivatives.

ie. " " " " " "
the only neutral nucleophile which is strong nucleophile



If everything else remains same a stronger nucleophile favours $SN2$ over $SN1$



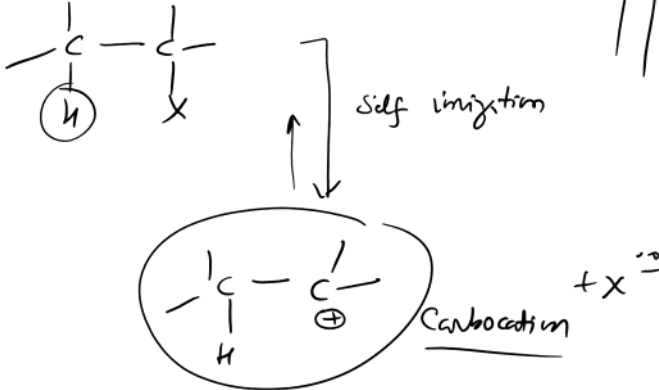
Role of Solvent: \rightarrow polar solvent encourage SN1 over SN2
 \rightarrow polar protic \Rightarrow SN1
 \rightarrow " aprotic \Rightarrow SN2

rate₁ = rate₂

E1 reaction! (α, β -elimination)
 Unimolecular elimination
 two step
 Carbocation mechanism
 possibility of rearrangement
 1st step (Self ionization)
 presence of acidic hydrogen
 @ β -position to halogen
 substituted C.

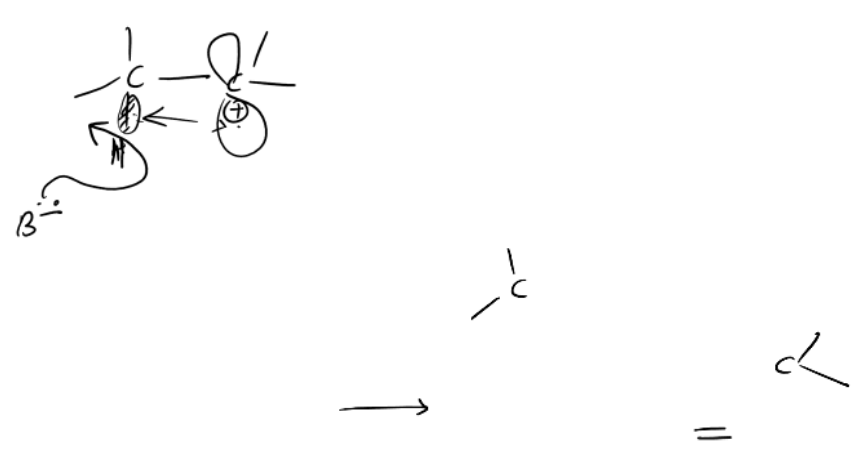
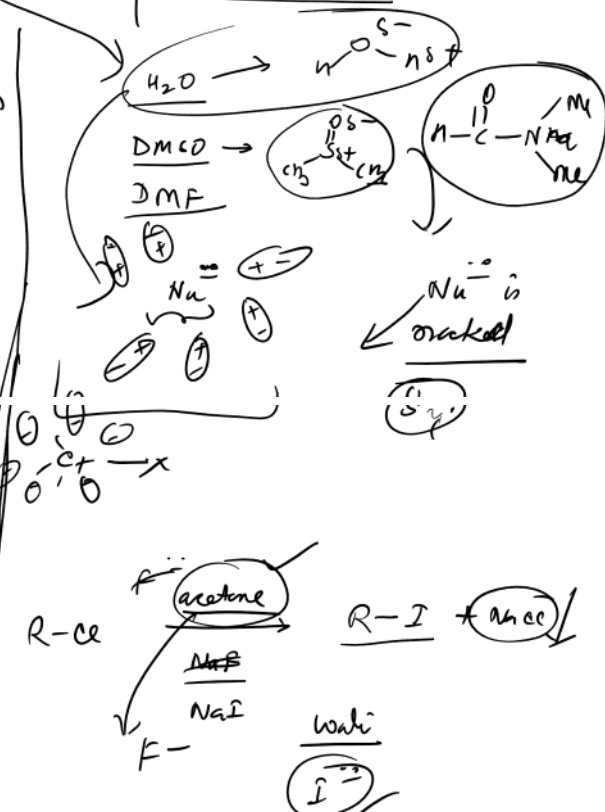
~~Step:~~

Step-1



Step: 2 (SN1 & E1 rxn compete with each other)

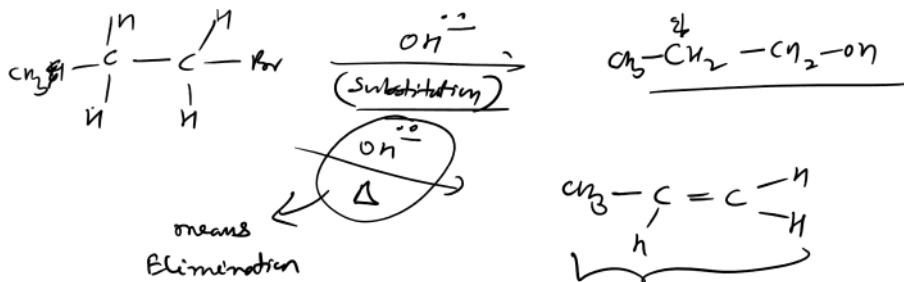
with heat elimination is favored over substitution.



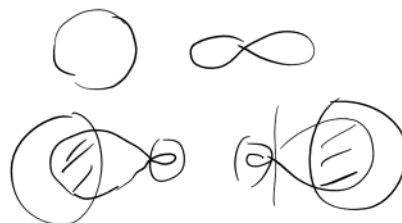
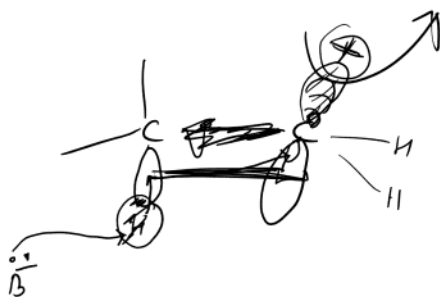
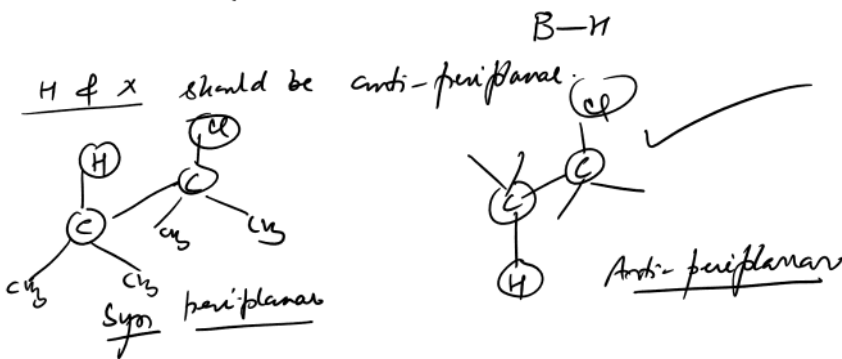
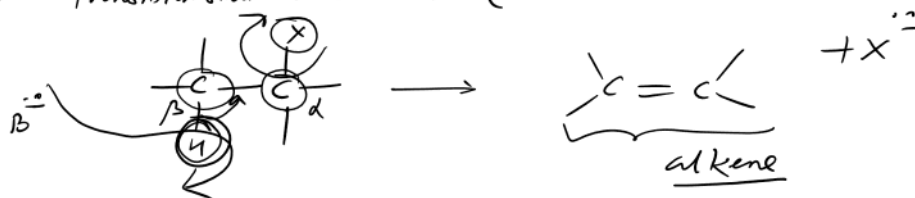
(Zaitsev product)
more stable alkene

alkene

eg:



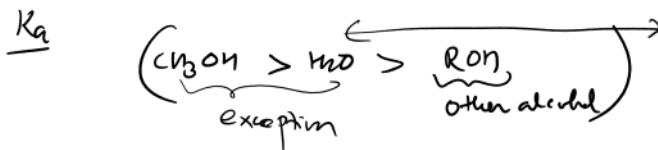
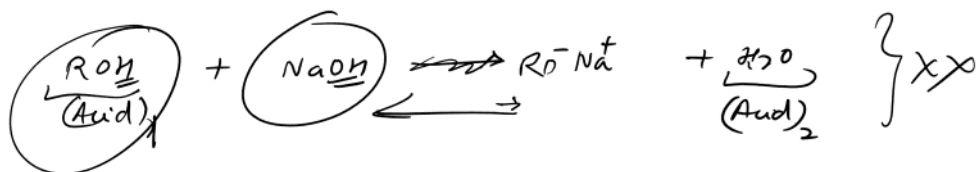
E2 → Single step (α, β -elimination) $\xrightarrow{\text{E2}}$ Anti-elimination
 transition state mechanism (concerted mechanism)



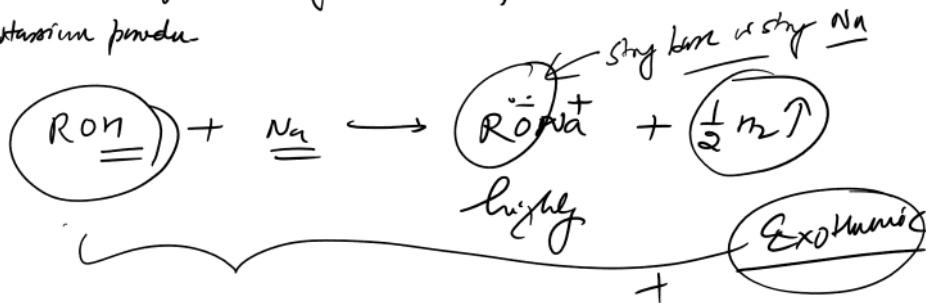
Alkoxide:



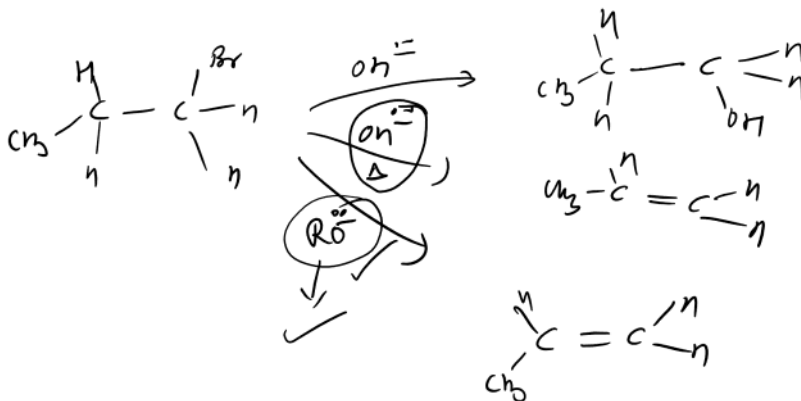
$\text{RO}^- \text{K}^+$ Potassium " "



Alkoxide are prepared by reaction of alcohol with sodium or potassium powder



RO^- or $\text{RO}^- \text{Na}^+$ } \Rightarrow consider it with heat



\uparrow steric factor E2 is favored $\text{E1 is favored over E2}$

$\left\{ \begin{array}{l} \text{SN1 competes with SN2 E1} \\ \text{E2 " " " " E2} \end{array} \right\}$