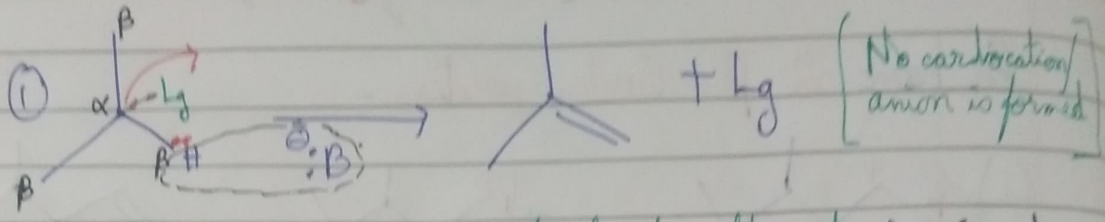
4) E^2 → Bimolecular Elimination

Here, Elimination = kicking out β-hydrogen & Lg (leaving group)

Bimolecular = reaction takeplace two molecules at a time
(2nd order reaction)

Mechanism:



Here, The base attacks molecule directly at β-H position

Therefore, its a one step reaction

Rate :- Step ① is the rate determining step

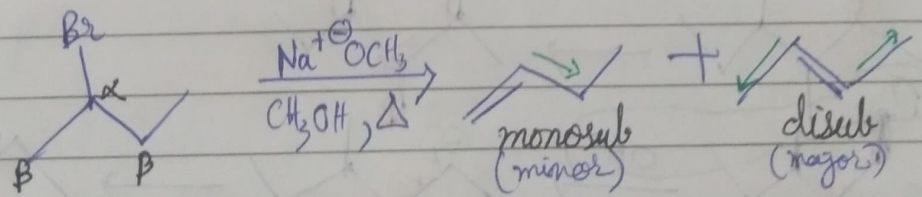
In terms of Kinetics,

Rate is dependent on the substrate & base concentration (attacking)

∴ Rate = $k[R-X][B]$

Where $[R-X]$ → concentration of substrate
$[B]$ → concentration of attacking base $:\overset{\ominus}{B}$
k → rate constant

Conditions:

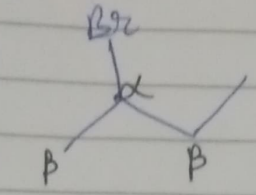


For E^2 reaction to occur,
- Strong attacking base ($\overset{\ominus}{O}CH_3$)
- Polar protic solvent (CH_3OH)
- △ indicates $E^2 > SN^2$

In E^1, the attacking base is weak
In E^2, the attacking base is strong

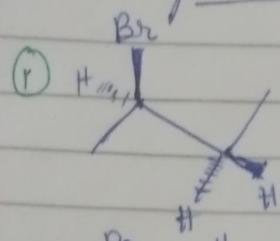
Polar Aprotic Solvents are involved in E^2 reactions

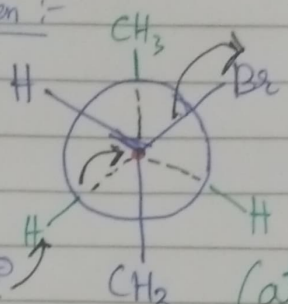
But, the main factor that influences the type of elimination reaction is strength of base & good leaving group

In 

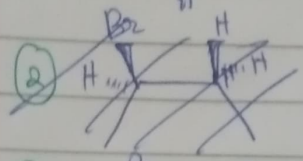
$\xrightarrow{\ominus OCH_3}$ { • Br → good leaving agent ; $^{\ominus}OCH_3$ → strong base }

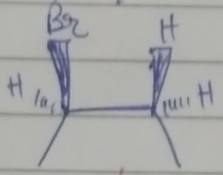
In terms of Newman's projection :-

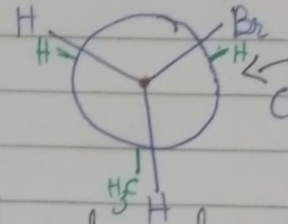
Case :- (1) 

⇒ 

(attacks rear side)

(2) 

(2) 

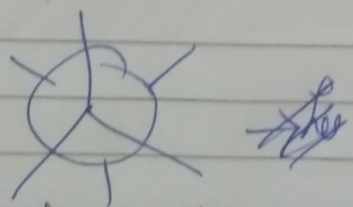
⇒ 

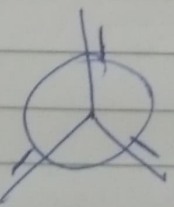
(attacks rear side)

But, due to adjacent carbons close together aligned in same plane, leading to steric hinderance / clashes of groups

This steric hinderance ~~causes~~ prevents the strong base from attacking the rear side

∴ Strong base favours attacking if there is less steric hinderence


Staggered
(Low steric hinderence)


eclipsed
(High steric hinderance)