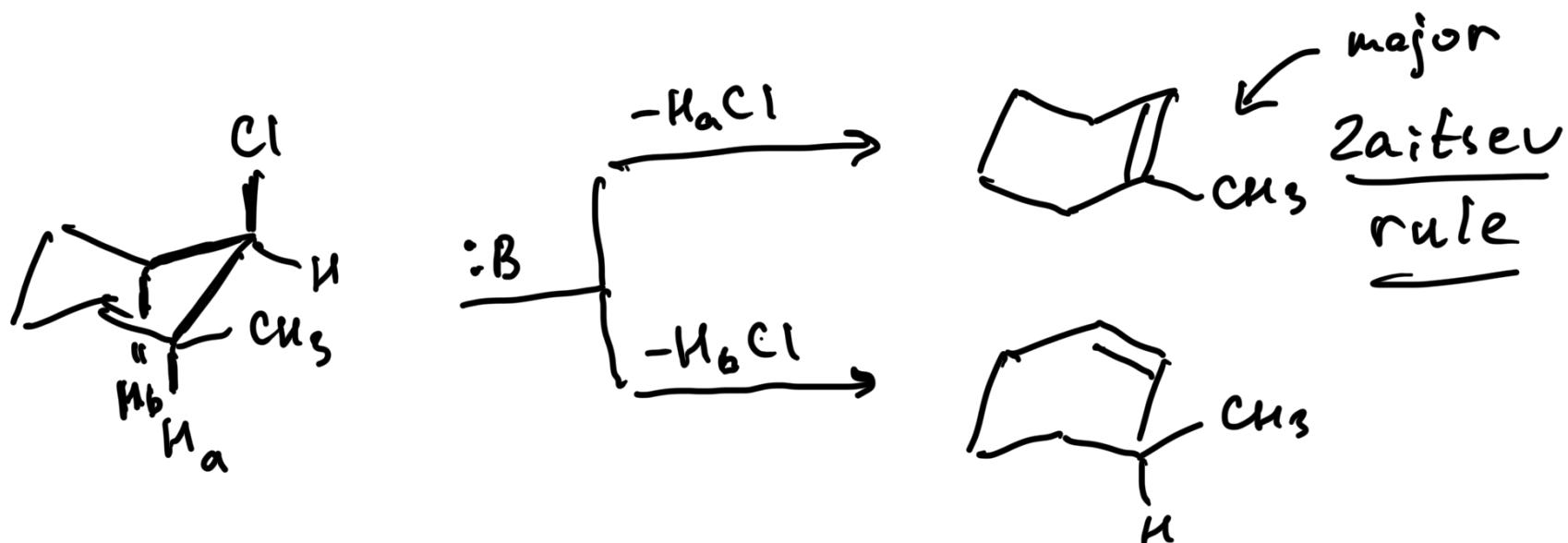
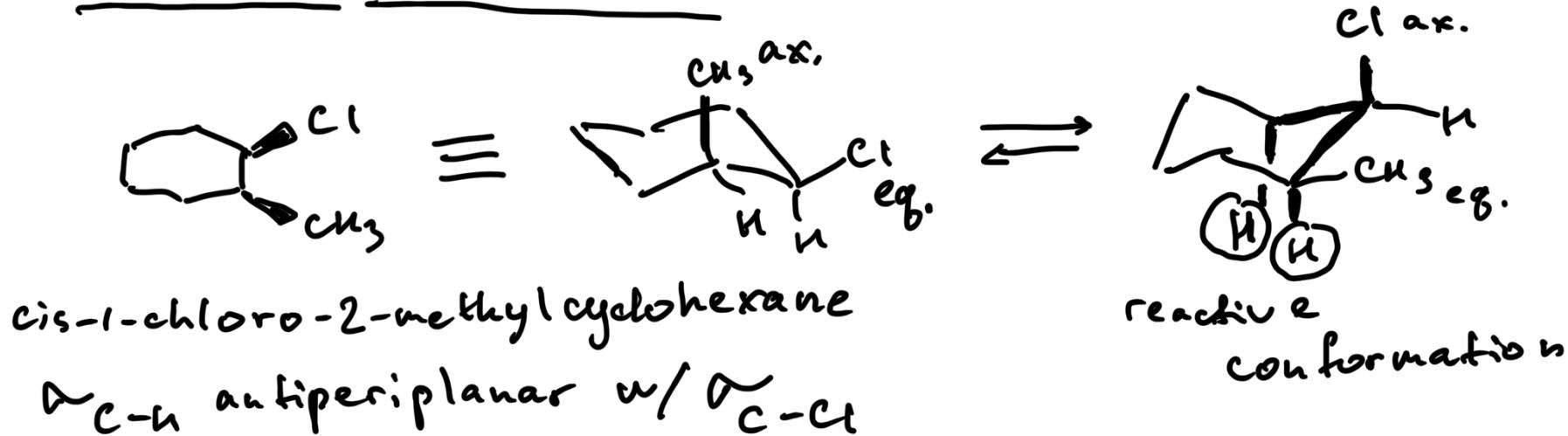


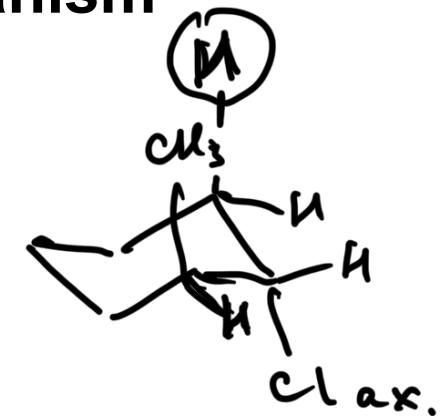
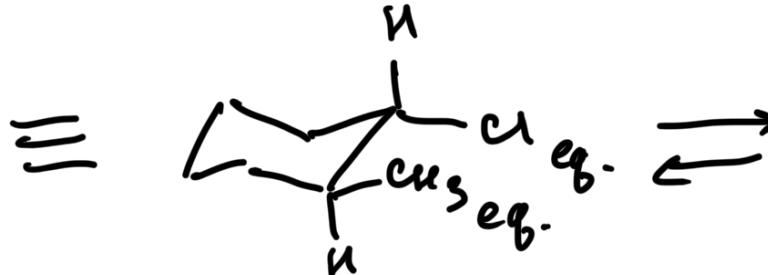
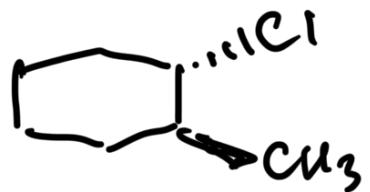
Elimination reactions: the E2 mechanism

Stereochemistry of the E2 reaction



Elimination reactions: the E2 mechanism

Stereochemistry of the E2 reaction



trans-1-chloro-2-methyl cyclohexane

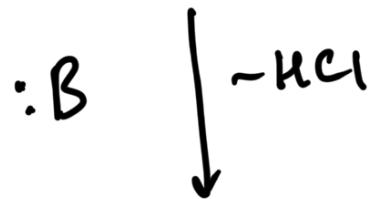
reactive conformer

- find π that can adopt anti-periplanar arrangement

- if multiple products possible \rightarrow apply Zaitsev rule

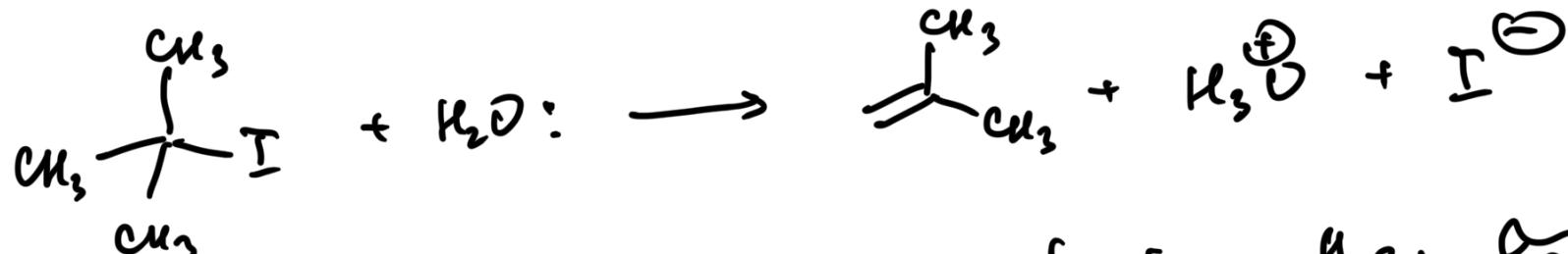


CH₃ only product observed

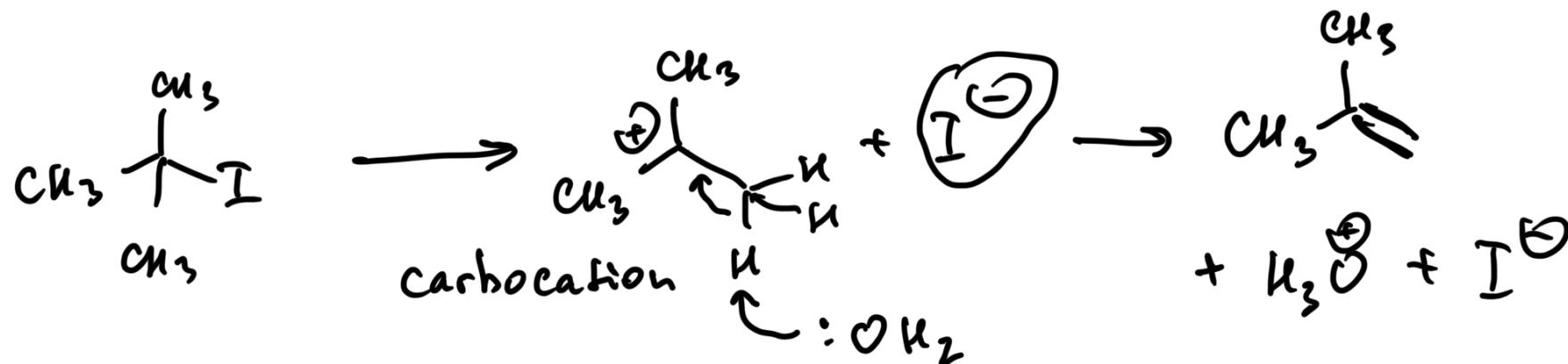


Elimination reactions: the E1 mechanism

Elimination unimolecular, kinetics and mechanism



rate = $k [t\text{-Bu I}]$ $\sim_{\text{C}-\text{I}}$ is broken, then $\sim_{\text{C}-\text{H}}$ is broken

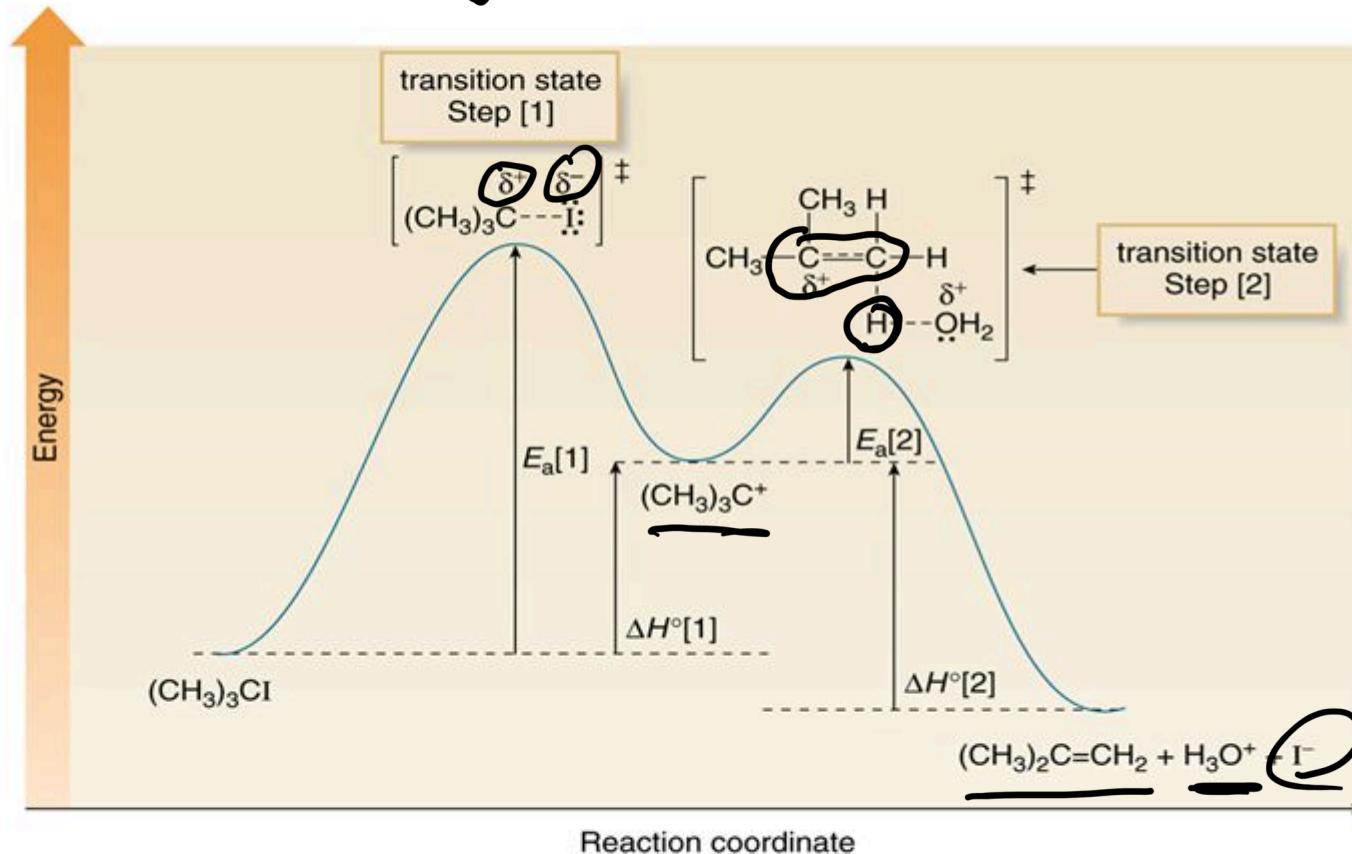


2-step mechanism

Elimination reactions: the E1 mechanism

Energy diagram

$T\delta \ddagger$ for rate-determining step



Elimination reactions: the E1 mechanism

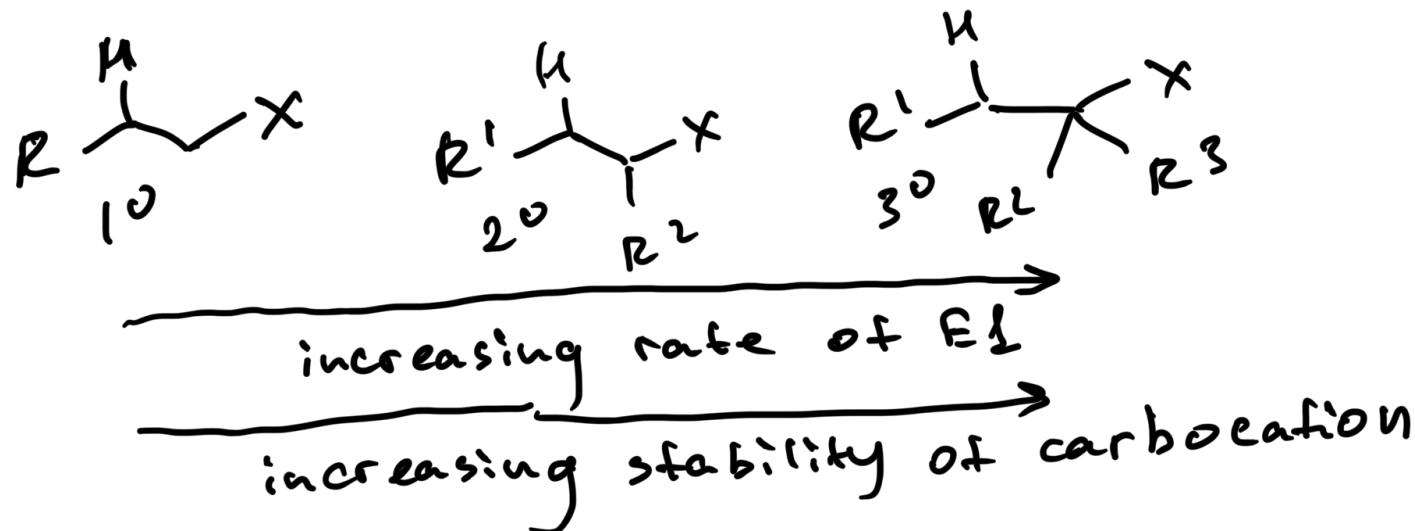
Effect of the base, the leaving group, and the solvent

- base is absent from kinetic equation
weak base favors E1
(over E2) no effect
- better leaving group \rightarrow faster E1
- solvent: polar protic solvents
are good for E1

Same trends for S_NI

Elimination reactions: the E1 mechanism

Effect of the structure of alkyl halide. A comment on S_N1 and E1

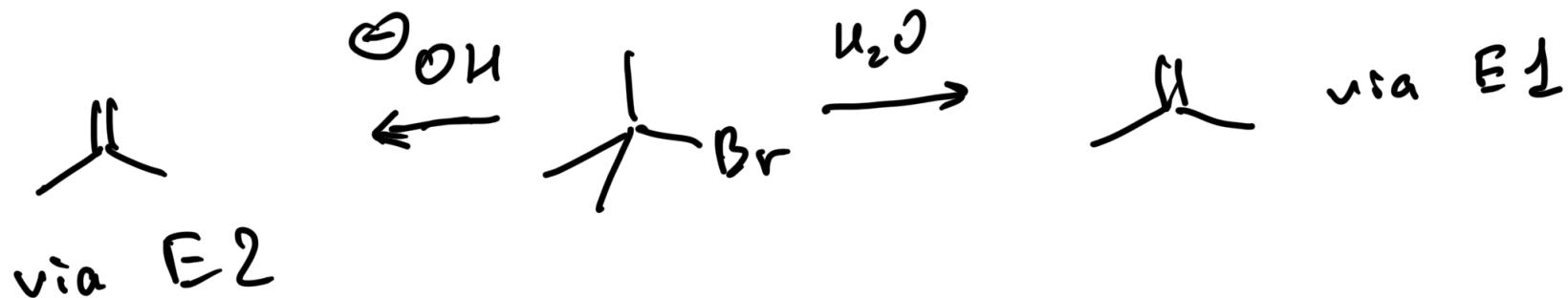


- 1° do not undergo E1
 - 3° are best for E1
 - 2° undergo E1, but slowly
- always mixtures of S_N1 and E1
(almost)

Elimination reactions: E2 or E1?

Effect of the base and the structure of alkyl halide (and the solvent)

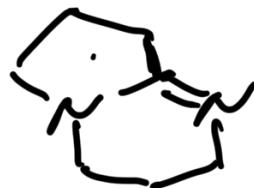
- The most important factor
 - weak base favors E1, strong base favors E2
- 1° do not undergo E1



Substitution and elimination reactions: S_N1, S_N2, E1, E2

Main factors contributing to the course of reaction

- good nucleophile, which is also a weak base : I^- , HS^- , CN^- , N_3^-
↓
substitution favored over elimination
- bulky, strong base (nonnucleophilic)
↓
favor elimination over substitution



DBN,



DBU

Substitution and elimination reactions: S_N1, S_N2, E1, E2

Main factors contributing to the course of reaction

Alkyl halide	Reaction with	Mechanism
Primary	Strong :Nu -	S _N 2
	Strong, bulky :B ^	E2
Secondary	Strong :Nu, strong :B -	S _N 2, E2 *
	Strong, bulky :B -	E2
Tertiary	Weak :Nu, weak :B -	S _N 1, E1
	Weak :Nu, weak :B -	S _N 1, E1
	Strong :B -	E2

can get
complicated ...

Substitution and elimination reactions: S_N1, S_N2, E1, E2

Case of tertiary alkyl halides

S_N1, E1, E2 not S_N2

- with strong base → E2 elimination
- with weak base, weak nucleophile



S_N1 and E1

Substitution and elimination reactions: S_N1, S_N2, E1, E2

Case of primary alkyl halides

S_N2, E2 not S_N1, E1

- with strong nucleophiles



S_N2 mechanism

- with strong, bulky base



E2 elimination

Substitution and elimination reactions: S_N1, S_N2, E1, E2

Case of secondary alkyl halides

S_N2, S_N2, E1, E2

- with strong base and nucleophile
↓

S_N2 and E2

- with strong, bulky base

↓

E2

- weak nucleophile or base
↓

S_N1 and E1

Substitution and elimination reactions: S_N1, S_N2, E1, E2

Case of secondary alkyl halides