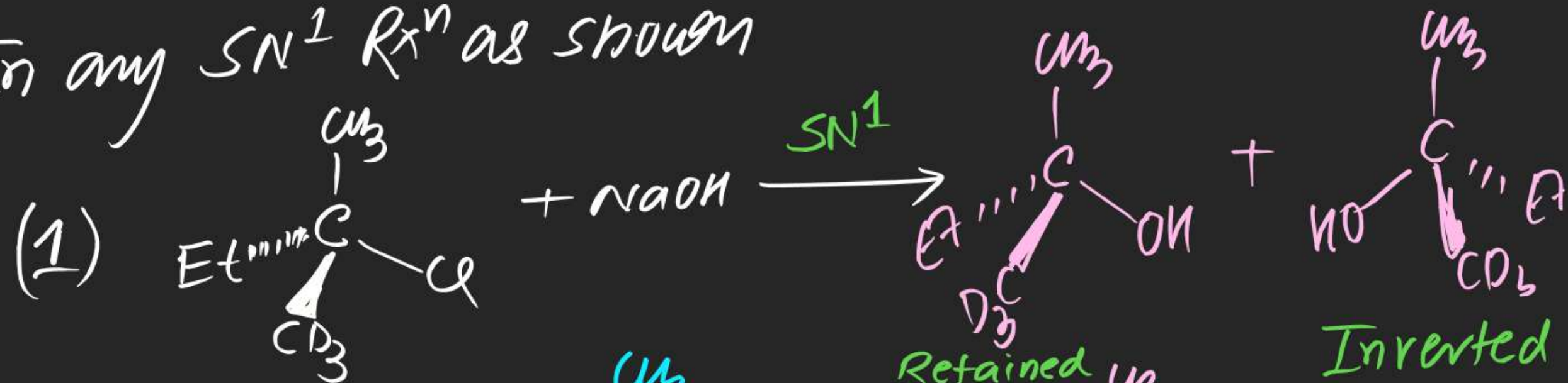
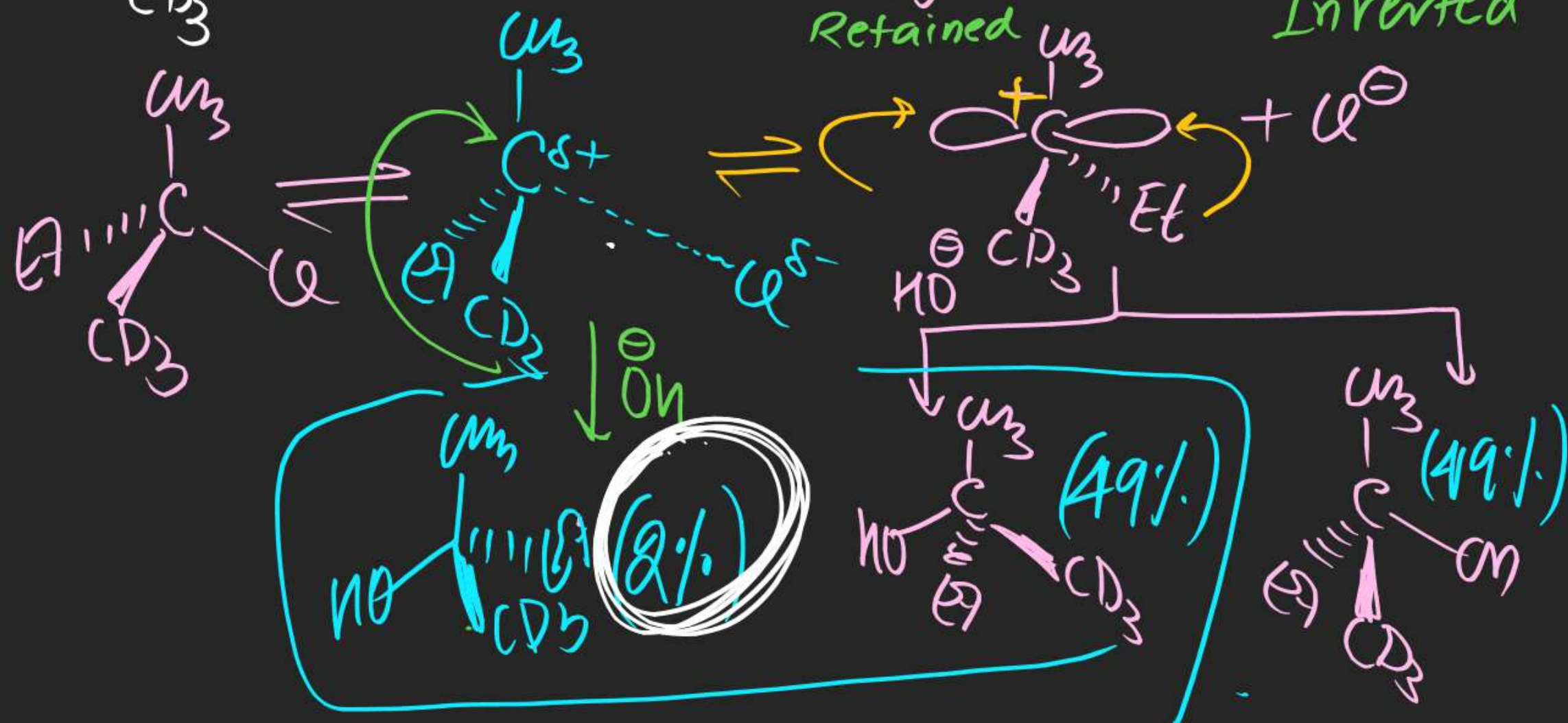


# (#) Stereochemistry of $S_N1$ mechanism:

In any  $S_N1$  Rx<sup>n</sup> as shown



mech<sup>n</sup>:



Note (i) ~~During~~ <sup>During</sup>  $S_N^1$  mechanism **Partial Racemisation** takes place.

(2) Slightly Inverted product dominates over Retained product

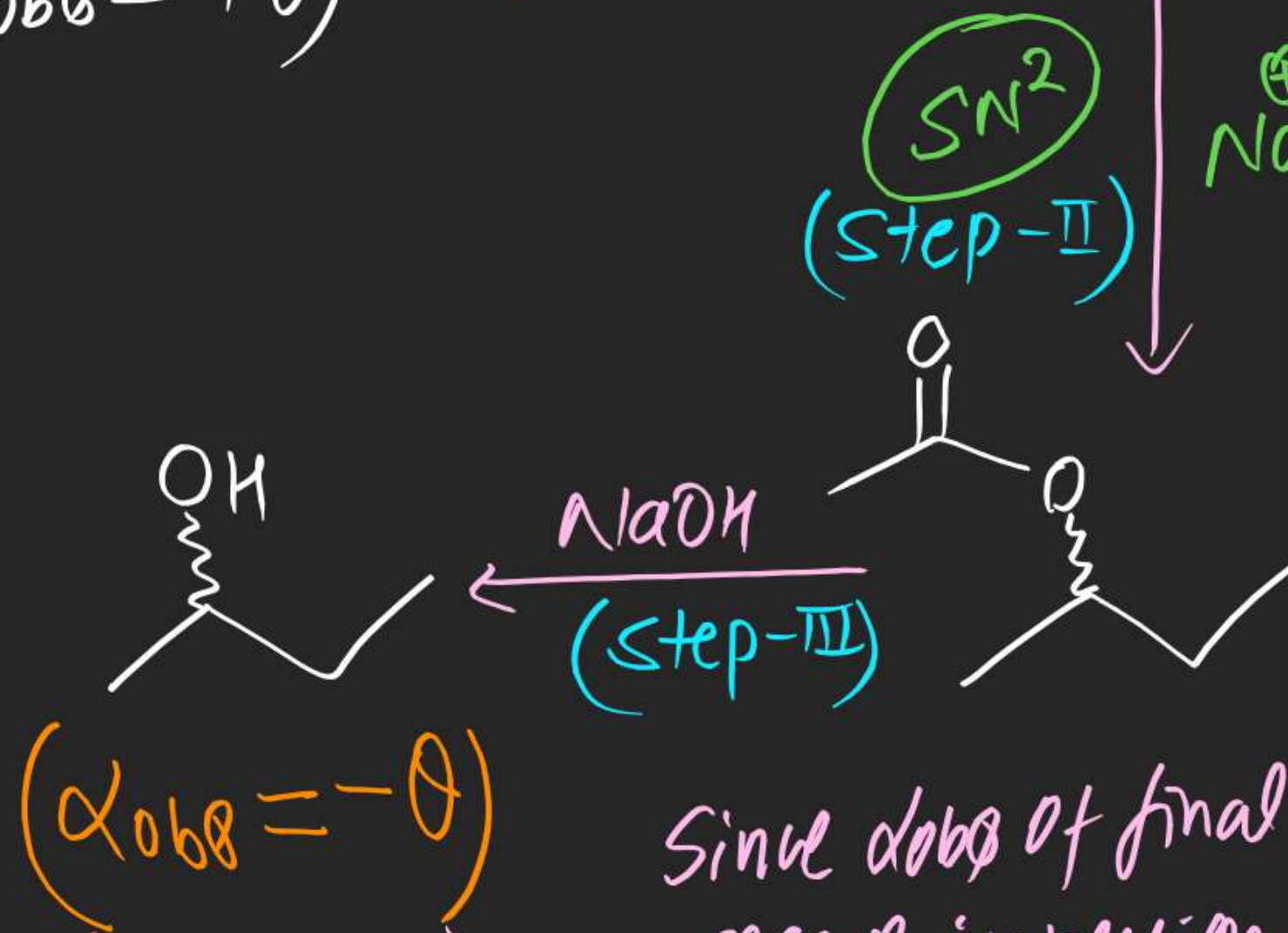
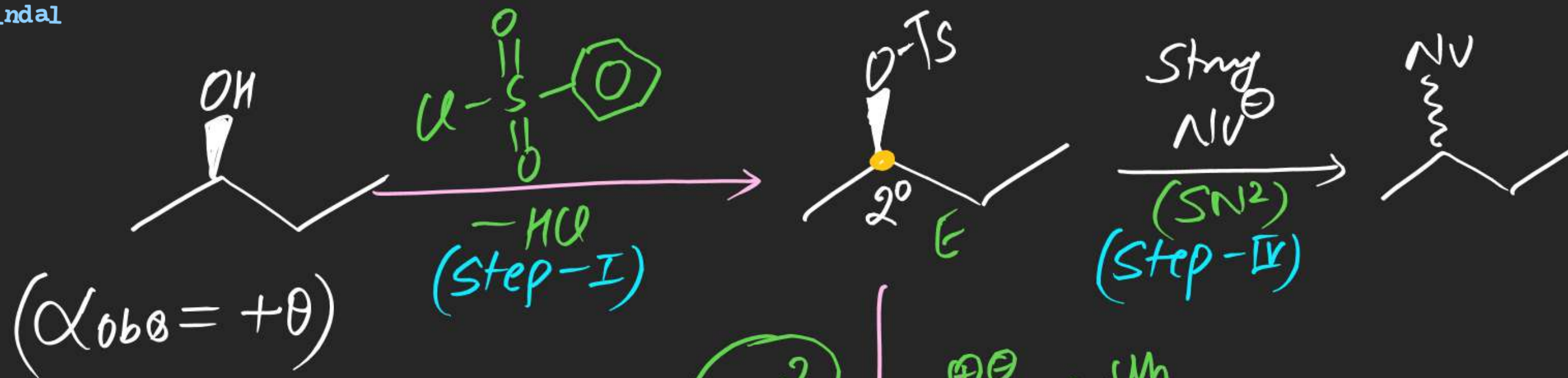
(3) Extent of Racemisation in  $S_N^1$  mech<sup>n</sup>

- $\propto$  Stability of Carbocation
- $\propto$  leaving tendency of  $lg$
- $\propto \epsilon$  (dielectric constant) solvent
- $\propto \frac{1}{\text{optical purity}}$

## (#) Stereochemistry of $S_N2$ mechanism:

- $\Rightarrow$  Inversion Takes place during  $S_N2$  mechanism & process is known as Walden Inversion.
- $\Rightarrow$  Configuration wd never change when Reaction doesn't take place at chiral centre
- $\Rightarrow$  Configuration *may or may not* change when Reaction takes place at chiral centre

Ex-1: In following Reaction sequence we are starting with an optically pure alcohol with known  $[\alpha]_D^{25}$



Configuration

Step-I  $\Rightarrow$  No change

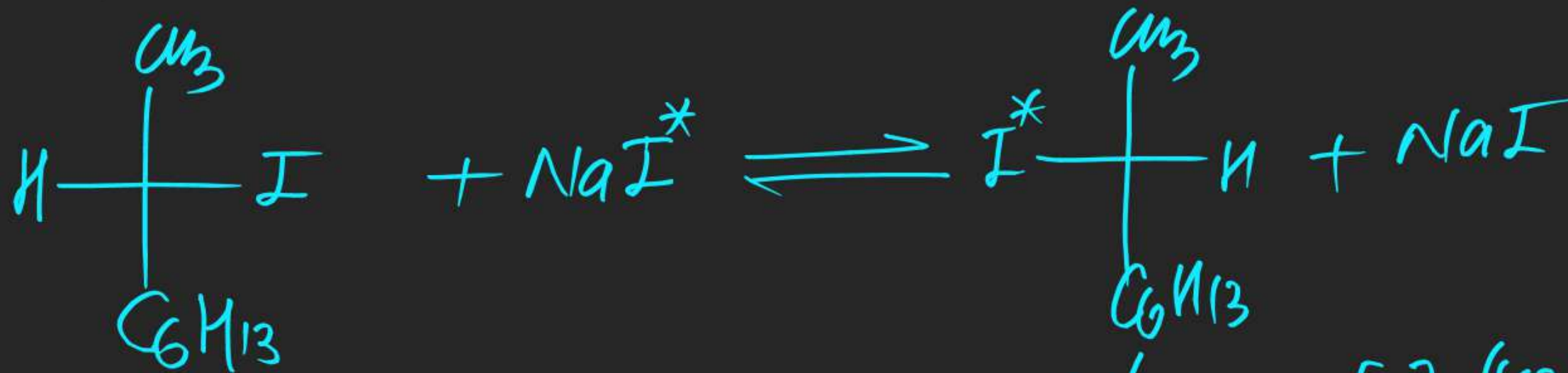
Step-II

Step-II  $\Rightarrow$  No change

Since obs of final alcohol is obtained  $(-\theta)$  it means inversion takes place in step (ii) ( $\text{S}_{\text{N}}2$ ).

Ex-2: (+)-2-Iodo octane gets slowly Racemised on Reaction with  $\text{NaI}^*$  ( $\text{I}^*$  Radioactive Iodine). Explain why?

Sol<sup>n</sup>:



$t=0$

100%

$t=t$

$(100-x)\%$

$t=\text{eq}$

50%

0%  
x%

50%

$[+] = (100-x)\%$

$[-] = x\%$

OP =  $100 - 2x\%$

Racemised part =  $2x\%$

$K_{eq} = 1$

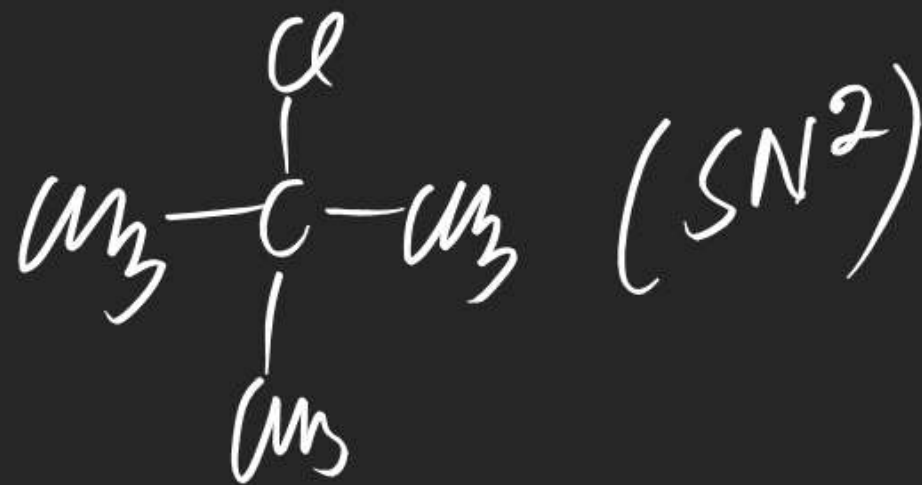
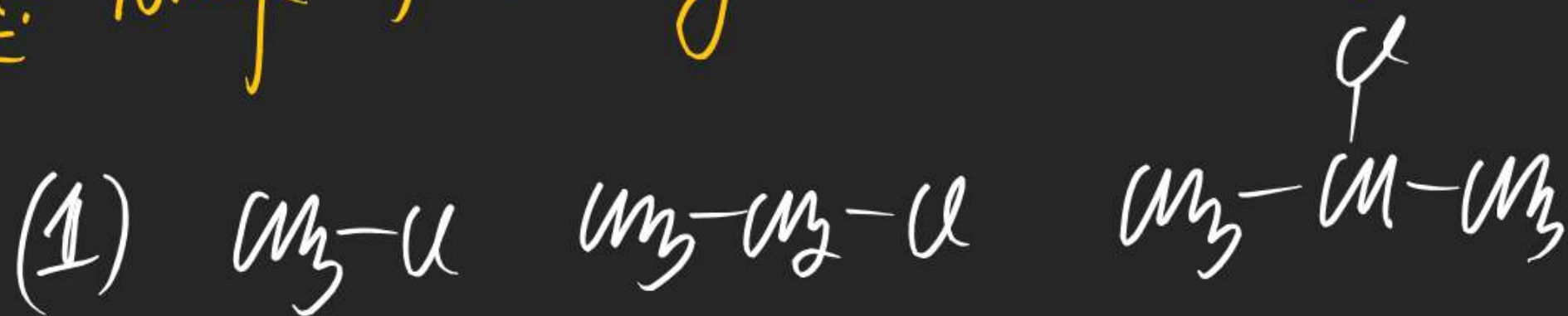
$\alpha_{\text{obs}} = 0$

Slow Racemisation is possible when mirror image compound of reactant is also present in mixture which wd certainly obtained By Inversion during  $S_N^2$  mechanism.

(\*)

$$\frac{\gamma_{\text{Racemisation}}}{\gamma_{\text{substitution}}} = \frac{2x}{x} = 2$$

Ex: Arrge following in  $\downarrow$  order of rate of  $S_N$  mechanism



(2) ----- (SN<sup>1</sup>)

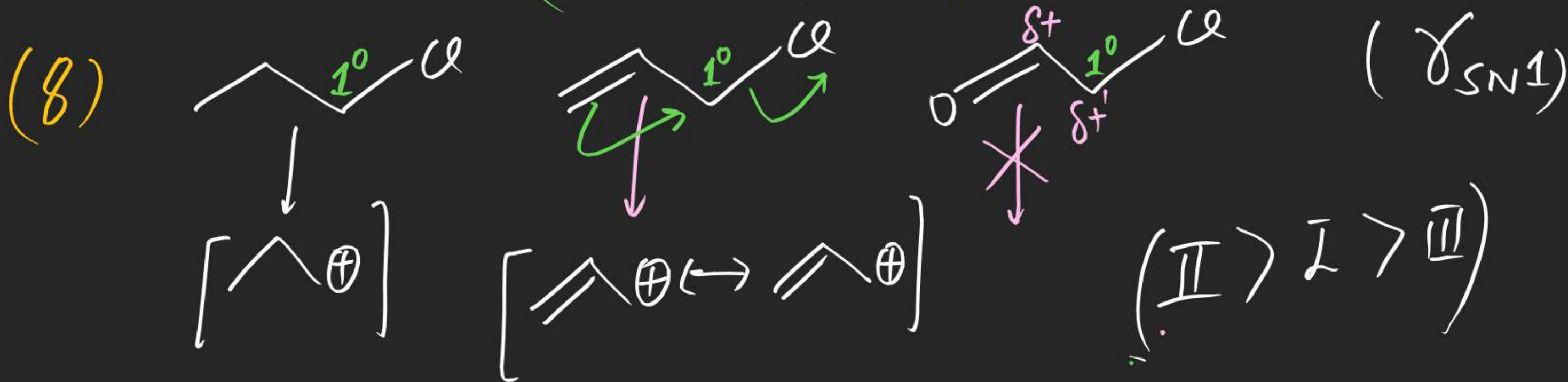
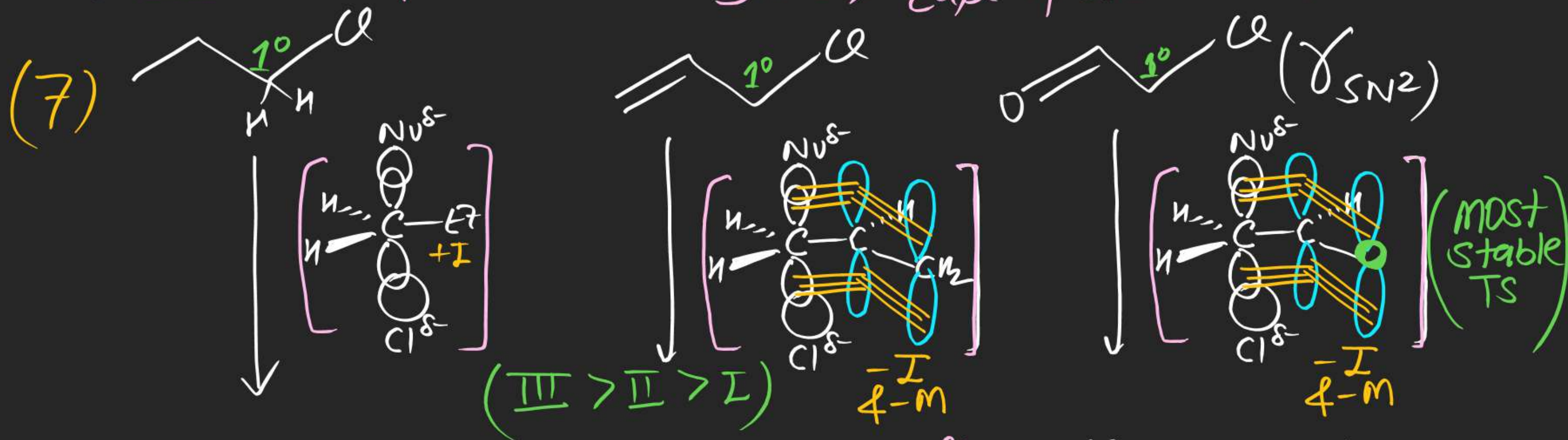
(3) CCCl COC(Cl)C (SN<sup>2</sup>)

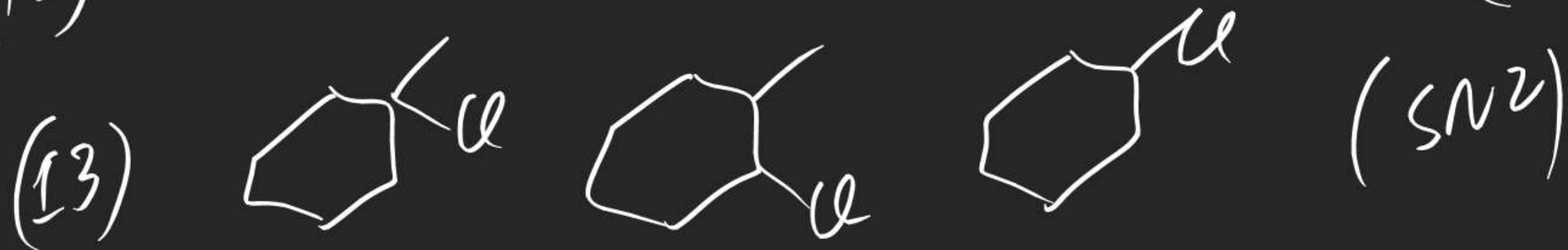
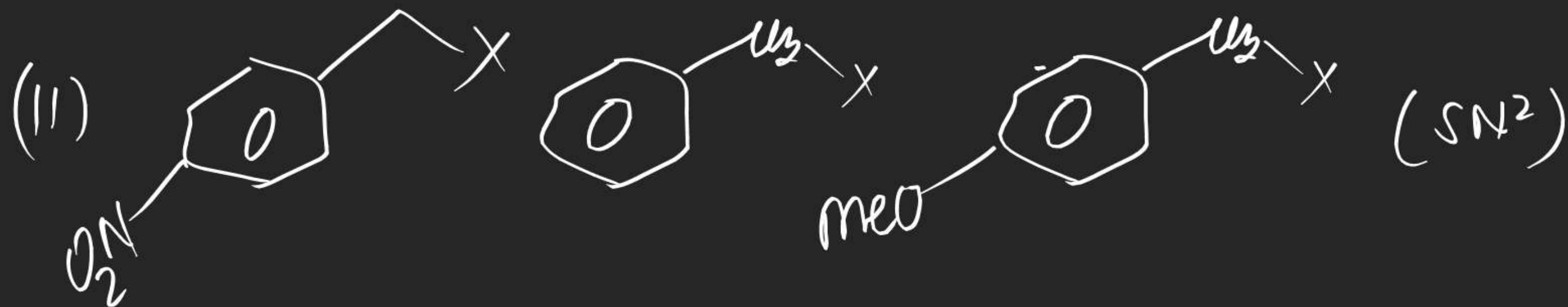
(4) ----- (SN<sup>1</sup>)

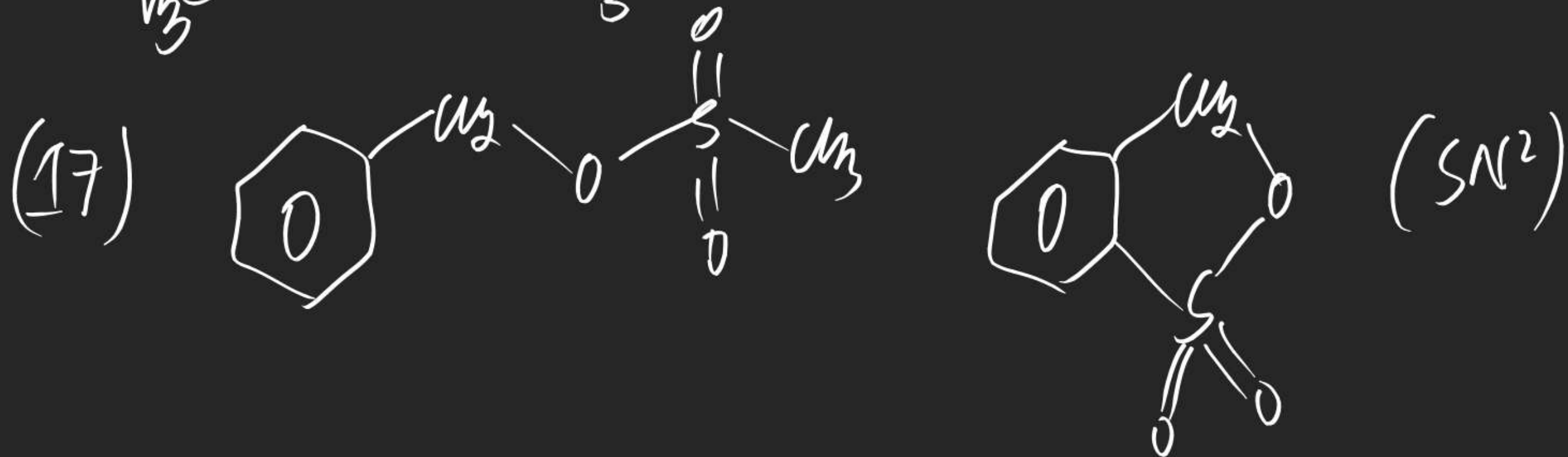
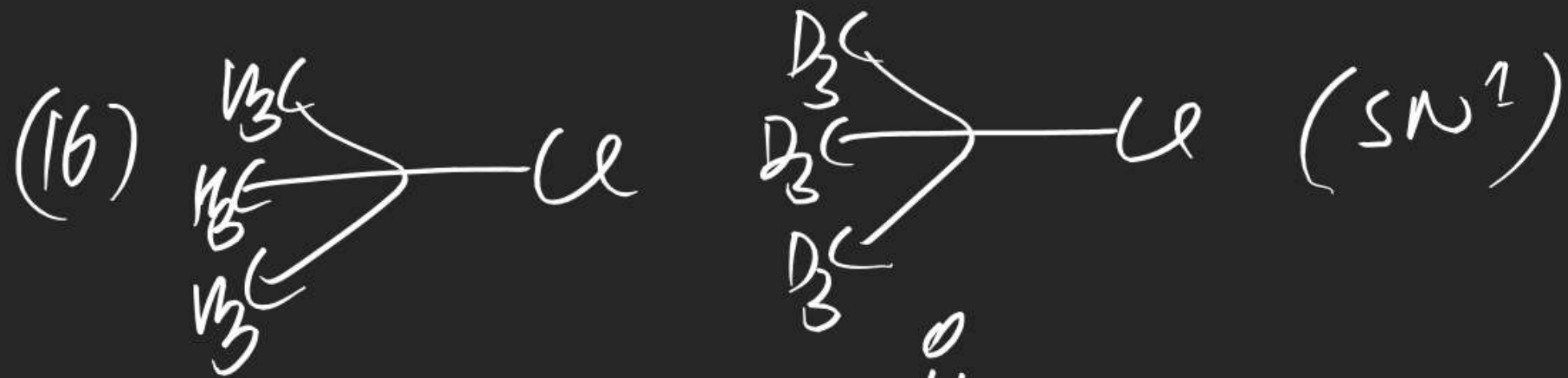
(5) ✓ CC(C)(C)Cl CC(C)C(Cl)C CC(C)CCl (SN<sup>2</sup>) (III > II > I)

(6) ----- (SN<sup>1</sup>) (I > II > III)




If substrate degree is same  $SN^2 \Rightarrow$  T.S stability (EWG)  
 $SN^1 \Rightarrow$  Ease of dissociation



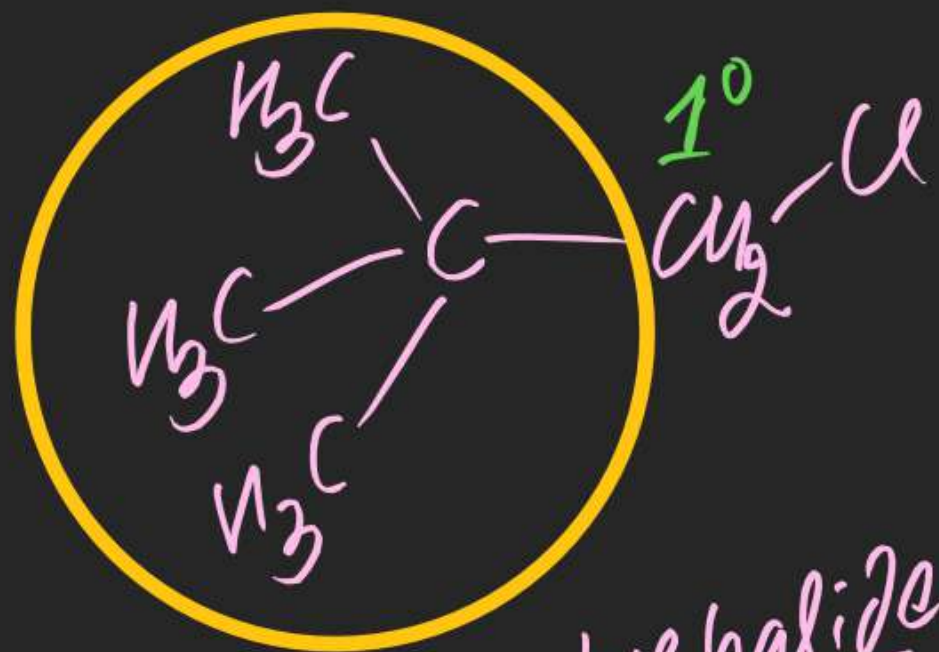




Note: (i) Following halides neither show  $S_N1$  nor  $S_N2$

		$S_N1$	$S_N2$
Aryl halide		X	X
Vinyl halide		X	X
Bridge head halide		X	X

(ii)



neopentyl halide

$S_N1$   $S_N2$   
 ✓ X  
 (slow)