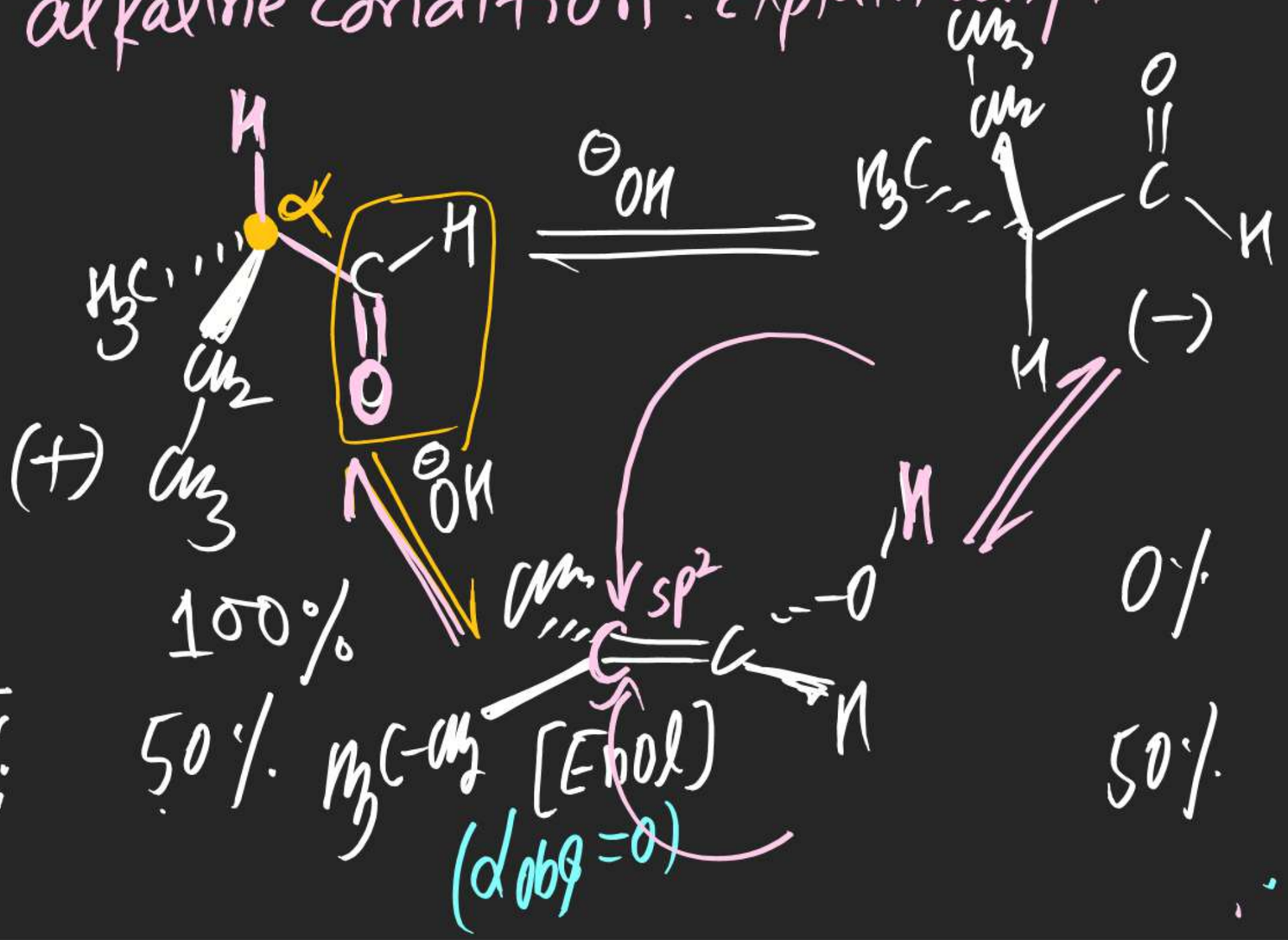
Nishant Jindal

STEREOISOMERISM

EX-1: (+)-2-methyl Butanal slowly Racemises in alkaline Condition. Explain why?

Soln:



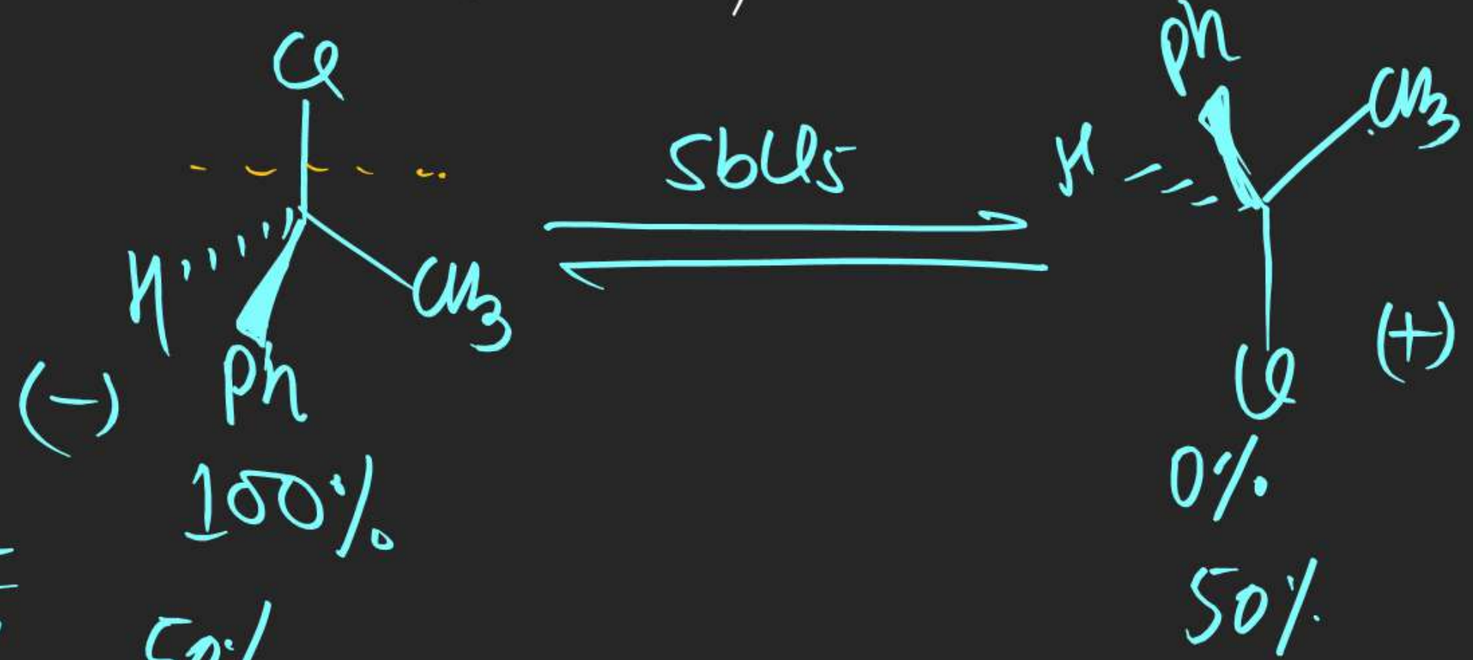
t=0	100%	0%
t=el:	50%	50%

Nishant Jindal

STEREOISOMERISM

Ex-2: (−)-1-chloro-1-Phenyl Ethane gets slowly Racemised on addition of $AlCl_3$/SbCl$_5$. Explain why?

Soln:

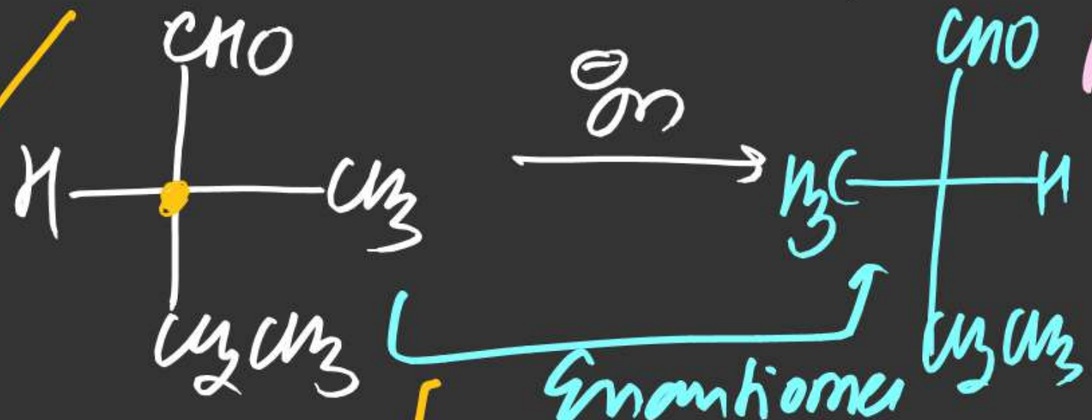


t=0	100%	0%
t=∞	50%	50%

Nishant Jindal

⇒ Find Reactions in which Racemisation takes place

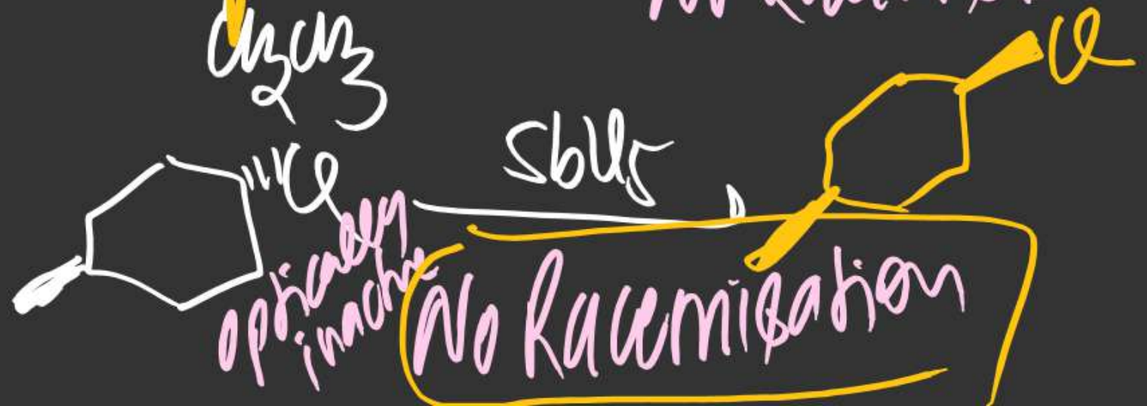
(3)



(4)

No Racemisation

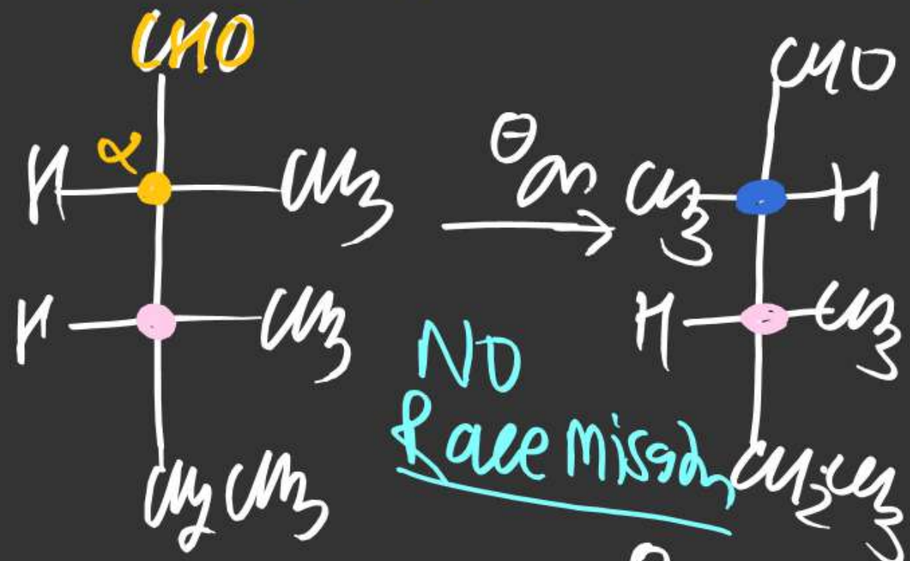
(5)



(6)

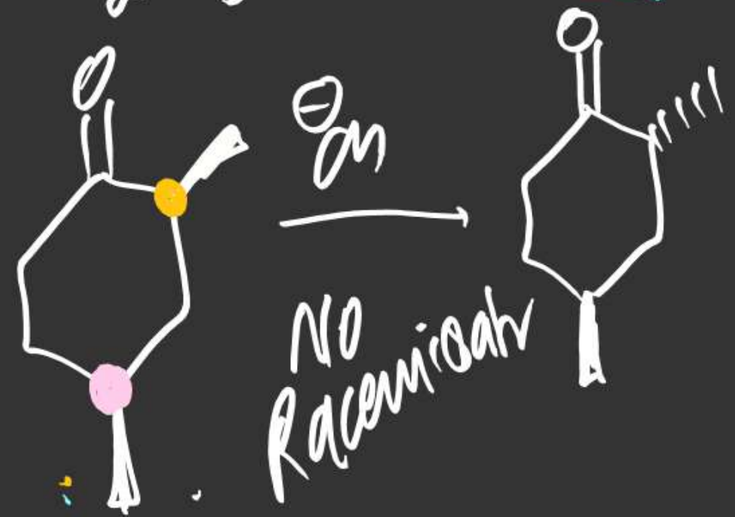
No Racemisation

(7)



No Racemisation

(8)



No Racemisation

Nishant Jindal

STEREOISOMERISM

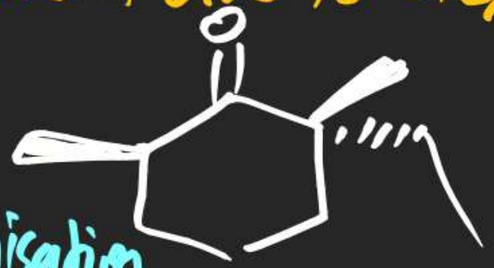
(9)

$\overset{\ominus}{O}H$

No Racemisation due to absence of "α" H

(10)

$\overset{\ominus}{O}H$



No Racemisation

Diastereomer

(3) Chemical method (Resolution)

⇒ In this method Enantiomeric mixture is converted in to Diastereomeric mixture By adding **chemically & optically Active External Reagent.**

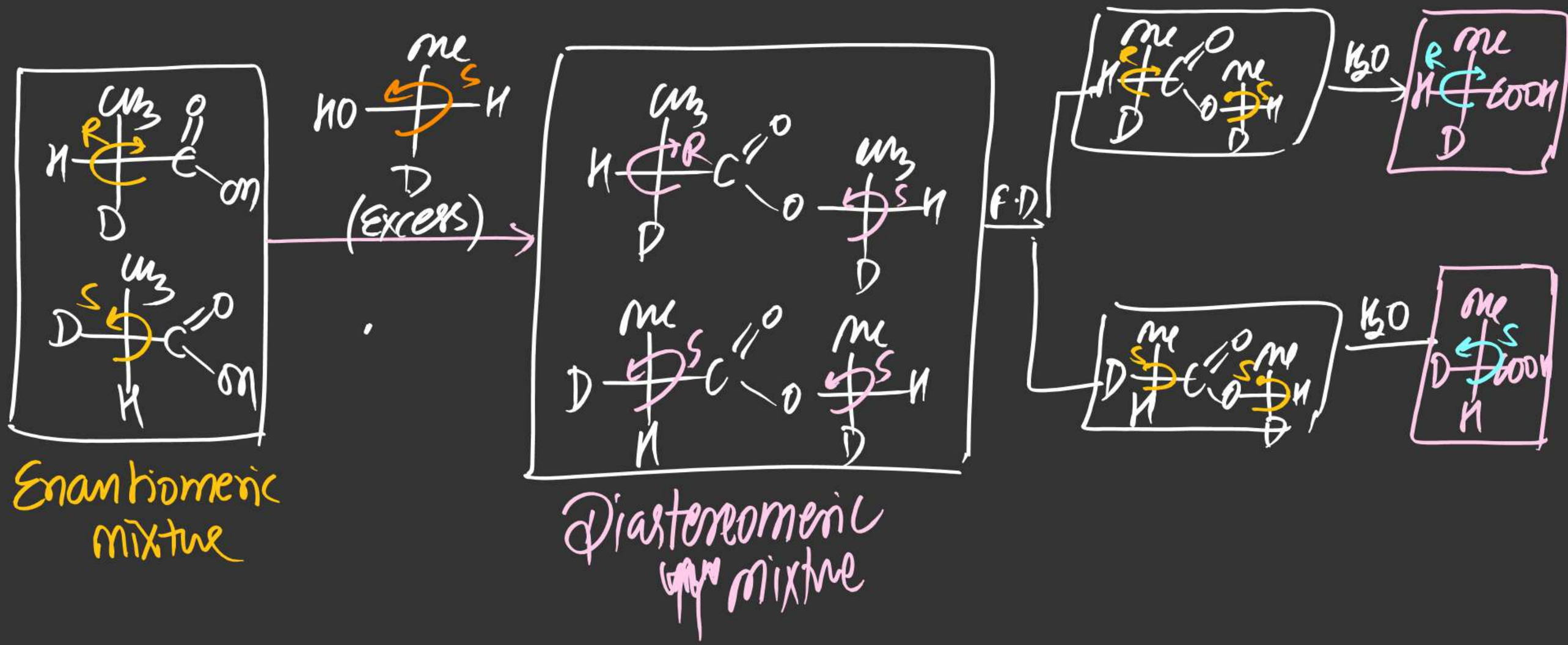
⇒

(a) $R-C(=O)-OH + H-O-R' \rightleftharpoons R-C(=O)-O-R' + H_2O$

Ester (Fruity smell)

(b) $R-C(=O)-OH + H_2N-R' \xrightarrow{\Delta} R-C(=O)-NH-R' + H_2O$

Nishant Jindal



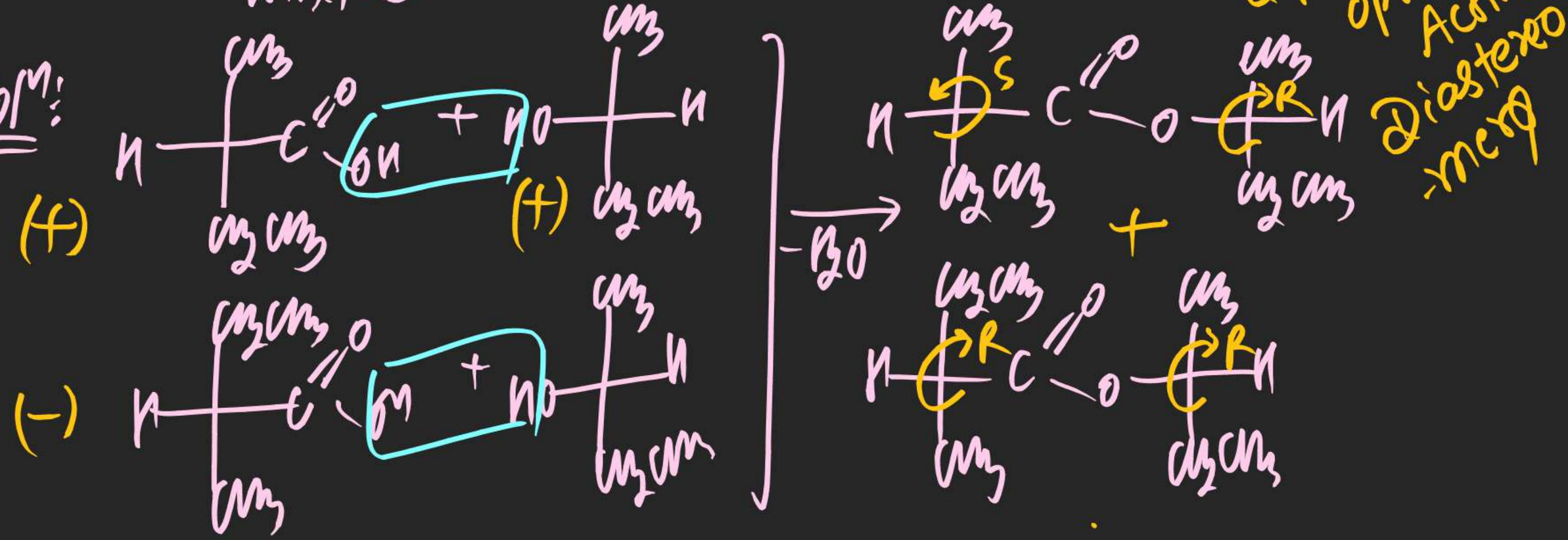
Nishant Jindal

Ex-1 !

(±)-2-methyl Butanoic Acid + (+)-2-Butanol ⟶

Enantiomeric mixture

Soln:



Nishant Jindal

STEREOISOMERISM

Ex-2:

(+)-2-methyl Butanoic Acid + (±)-2-Butanol ⟶

Ex-3:

(±)-2-methyl Butanoic Acid + (±)-2-Butenol ⟶ (4 product)

Q-4: Find Total no. of Compounds which can be used to Converted Enantiomeric mixture of Carboxylic Acid in to Diastereomeric mixture.

Nishant Jindal

Chemically Active

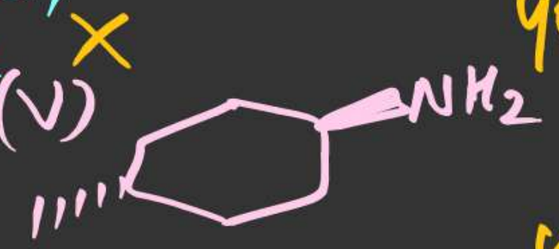
optically Active

(i)  yes yes

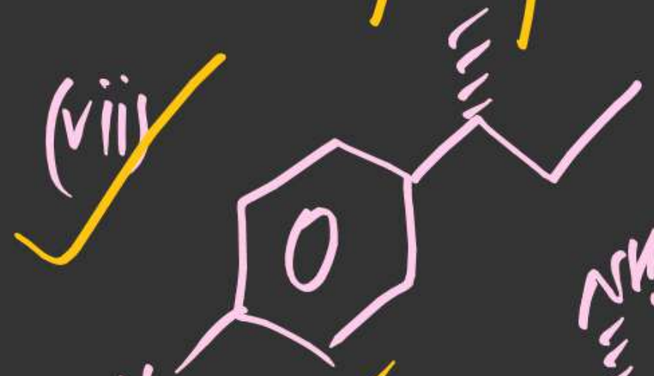
(ii)  yes yes

(iii)  yes yes

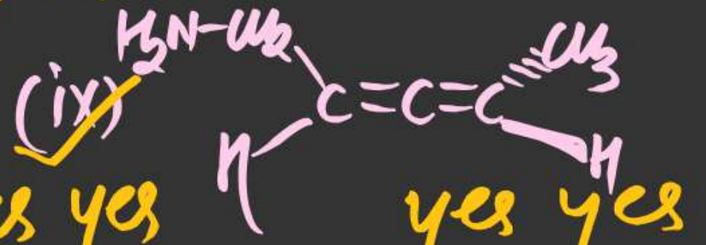
(iv)  yes No

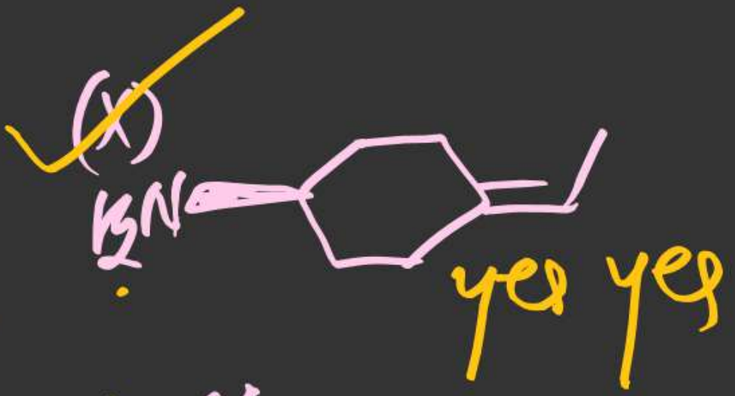
(v)  yes No

(vi)  yes yes

(vii)  yes yes

(viii)  yes yes

(ix)  yes yes yes yes

(x)  yes yes

X (xi)  No yes

$-OH$ & $-NH_2$ $\Rightarrow$ Chemically Active

Sn absent $\Rightarrow$ optically Active

(POS, COS)

(#) Calculation of optical Isomers / Stereoisomers:-

Always correct

$n \rightarrow$ number of sites which can show stereo-isomerism

Case(i): Compound is **not Symmetrical**

optically Active isomers $(a) = 2^n$

optically inactive isomers $(m) = 0$

Enantiomeric pair $(EP) = \frac{a}{2} = 2^{n-1}$

Total optical isomers $(T) = a + m = 2^n$

Case(ii): Compound is Symmetrical

n Even

$$a = 2^{n-1}$$

$$m = 2^{\frac{n}{2}-1}$$

$$\epsilon p = 2^{n-2}$$

$$T = 2^{n-1} + 2^{\frac{n}{2}-1}$$

n odd

$$a = 2^{n-1} - 2^{\frac{n-1}{2}}$$

$$m = 2^{\frac{n-1}{2}}$$

$$\epsilon p = 2^{n-2} - 2^{\frac{n-3}{2}}$$

$$T = 2^{n-1}$$

[Symmetrical, cyclic Branched compounds
These formulae are not aplicable]

Nishant Jindal

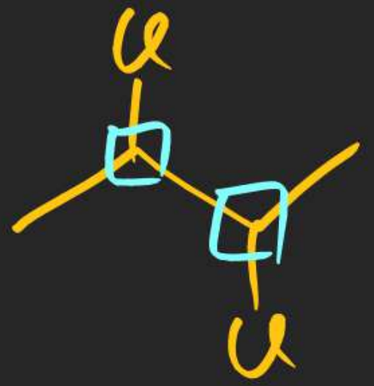
STEREOISOMERISM

(1)

$(n=1)$

$a = 2^1 = 2$
$m = 0$
$ep = 1$
$T = 2$

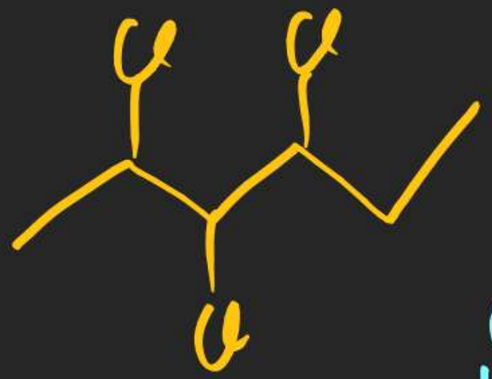
(2)



$(n=2)$

$a = 2^{2-1} = 2$
$m = 2^{1-1} = 1$
$ep = 1$
$T = 3$

(3)



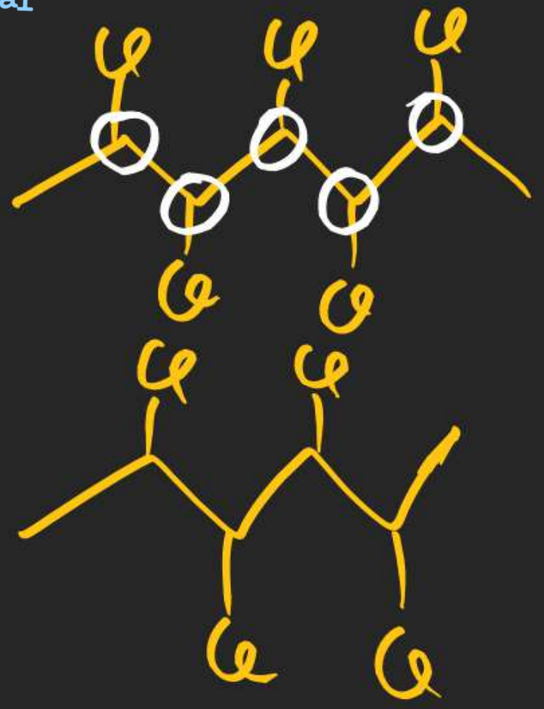
$(n=3)$

$a = 2^3 = 8$
$m = 0$
$ep = 4$
$T = 8$

Nishant Jindal

STEREOISOMERISM

(4)



(5)

(6) $Ph-\underset{\underset{Cl_3}{|}}{CH}-CH_3$

$(n=5)$ Symmetrical

$a = 2^{n-1} - 2^{\frac{n-1}{2}} = 2^{5-1} - 2^{\frac{5-1}{2}} = 2^4 - 2^2 = 12$

$m = 4$

$Ep = 6$

$T = 16$

$(n=4)$

$(n=3)$

$a = 2^3 = 8$

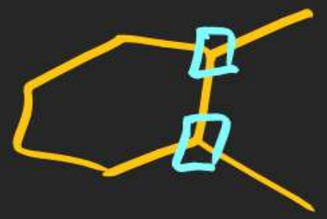
$m = 0$

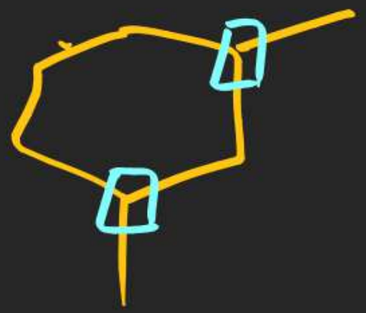
$Ep = 4$

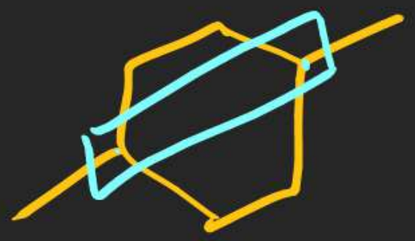
$T = 8$

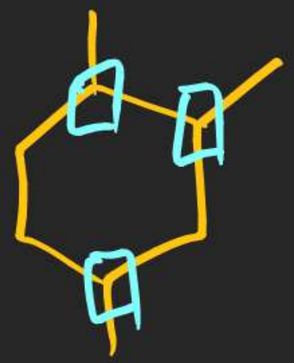
Nishant Jindal

STEREOISOMERISM

(7)  $(n=2)$

(8)  $(n=2)$

(9)  $(n=1)$

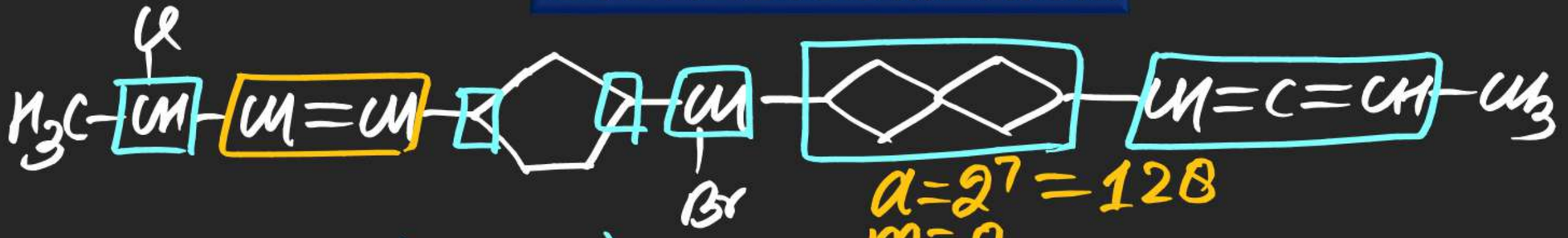
(10)  $(n=3)$

$a = 2^3 = 8$
$m = 0$
$EP = 4$
$T = 8$

Nishant Jindal

STEREOISOMERISM

(11)



$a = 2^7 = 128$
$m = 0$
$EP = 64$
$T = 128$

$(n = 7)$

(12)

$(n = 6)$

$a =$
$m =$
$EP =$
$T =$

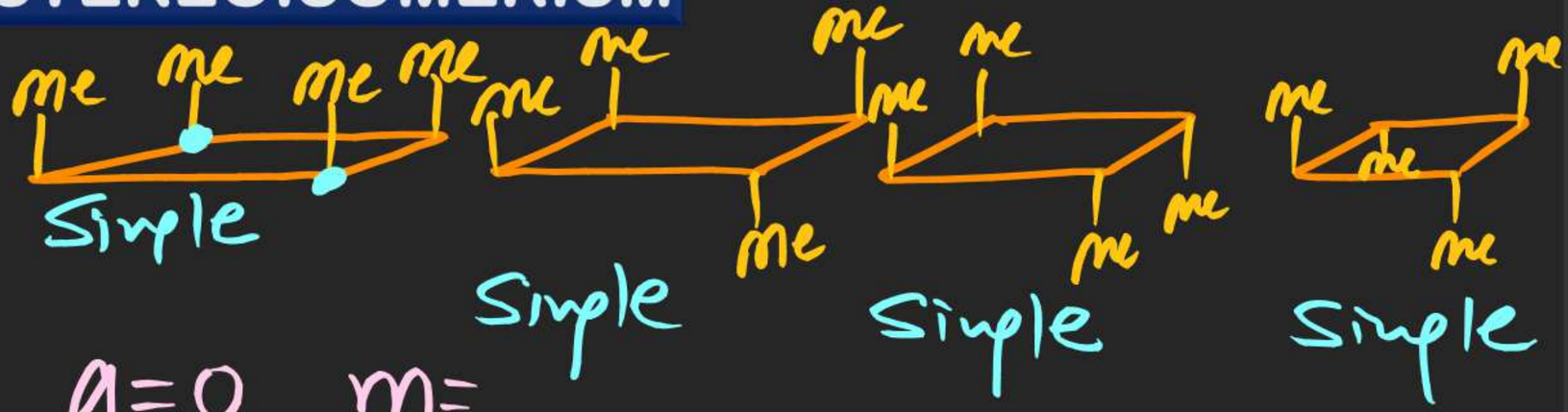
(13)

Nishant Jindal

STEREOISOMERISM

(14)

⇒



(15)

$a=0$ $m=$

$\epsilon p=0$ $T=4$

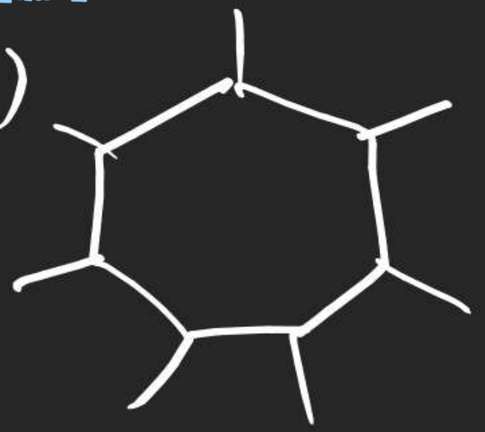
(16)

$T=4$

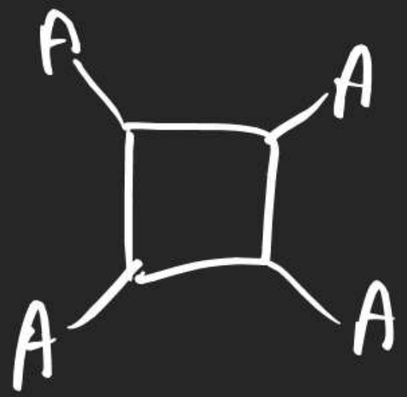
Nishant Jindal

STEREOISOMERISM

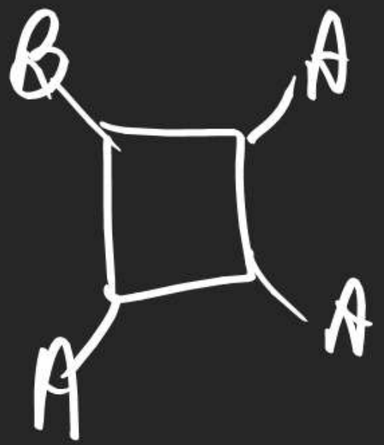
(17)



(18)



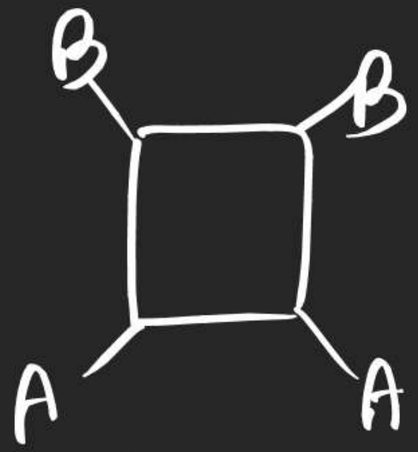
(19)



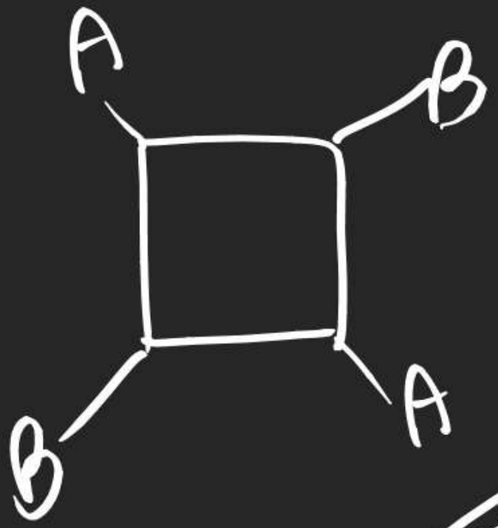
Nishant Jindal

STEREOISOMERISM

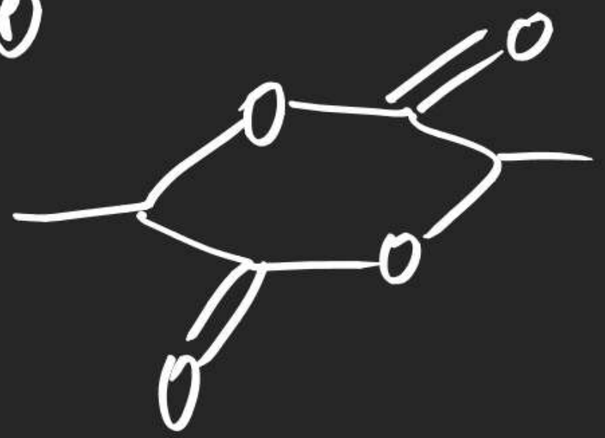
(20)



(21)



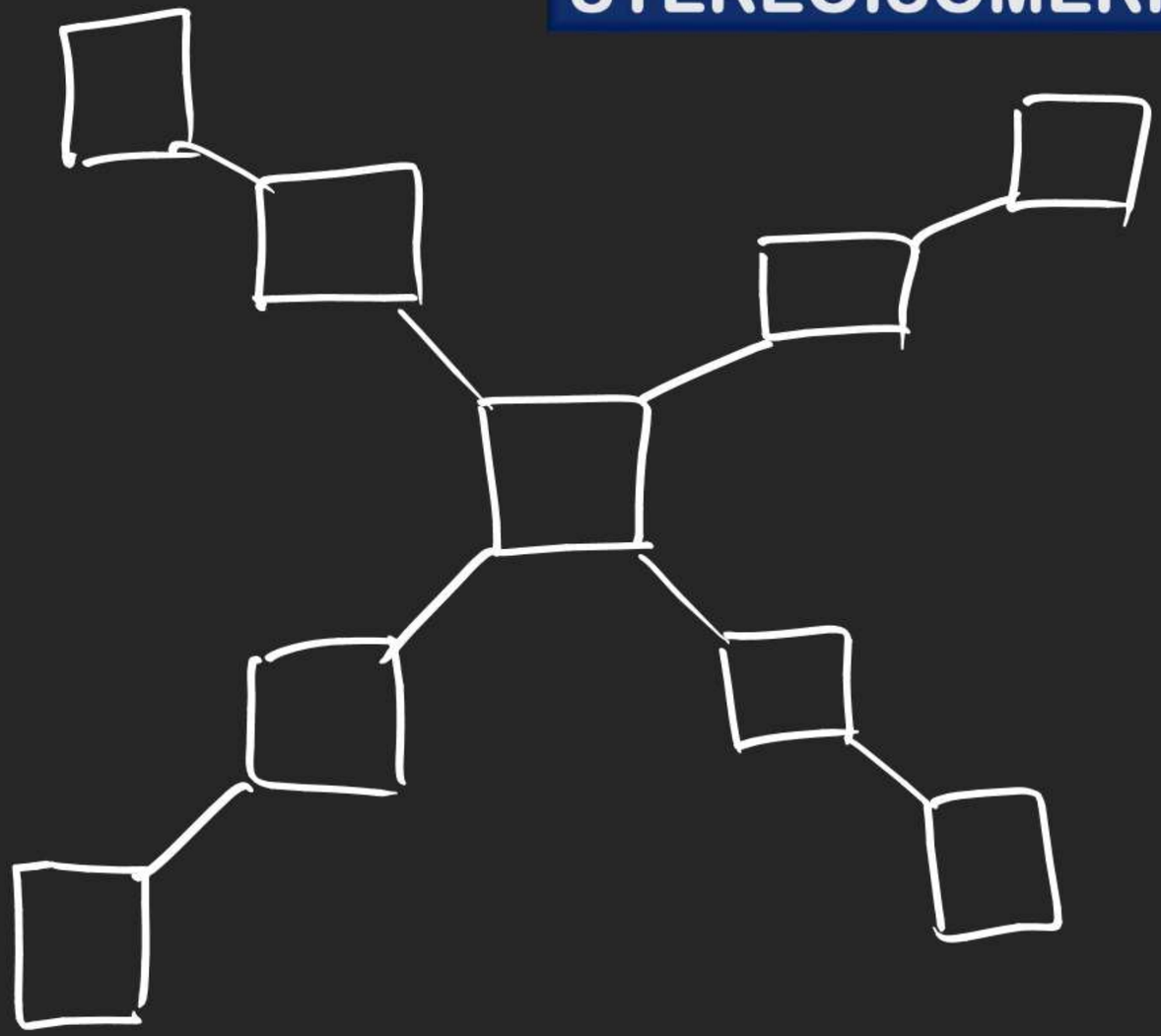
(22)



Nishant Jindal

STEREOISOMERISM

(23)



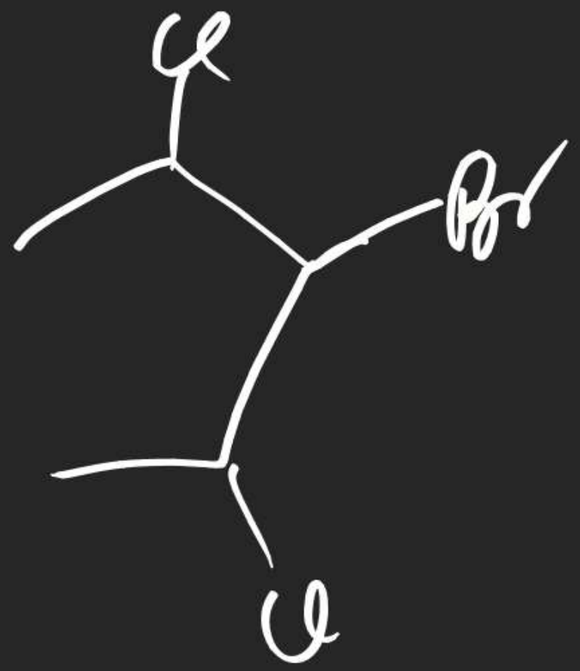
Nishant Jindal

STEREOISOMERISM

(24) $H_3C-CH=CH-\underset{Cl}{CH}-CH=CH-CH_3$

(25) $CH_3-\underset{Cl}{CH}-CH=CH-\underset{Cl}{CH}-CH_3$

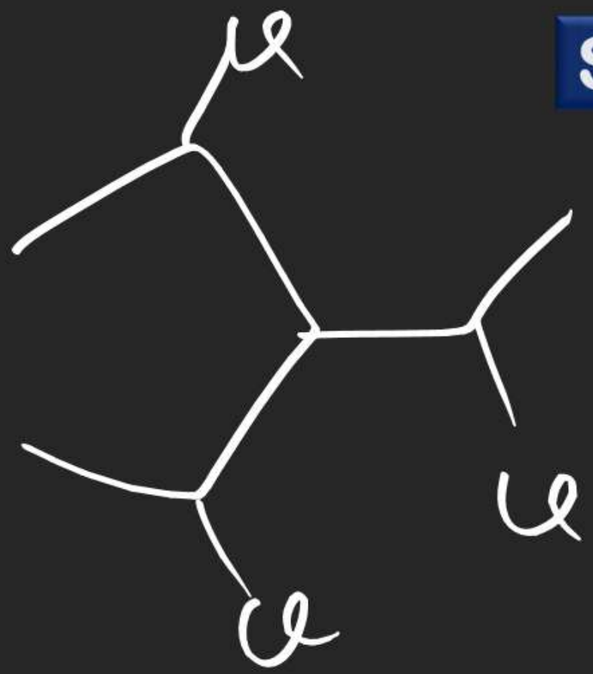
(26)



Nishant Jindal

STEREOISOMERISM

(27)



(28)