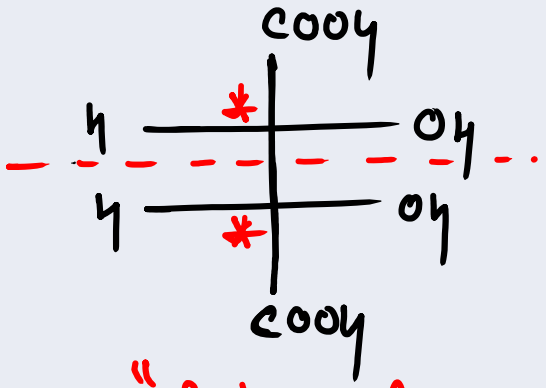
Meso compound.

1) These molecules would have internal POS / CAS.
OR

2) Atleast two chiral centers.

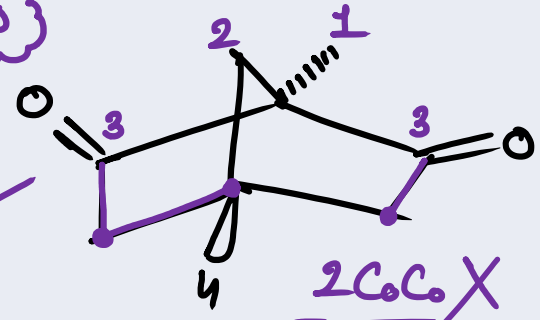
Racemic mix
↓
R = S
⇒ 'External Compensation'



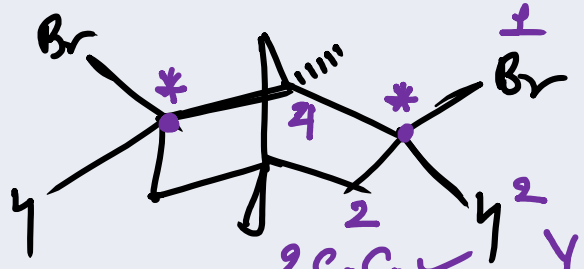
2 C.C ✓
POS ✓
Meso

⇒ "internal compensation" inactive

No
POS ✓

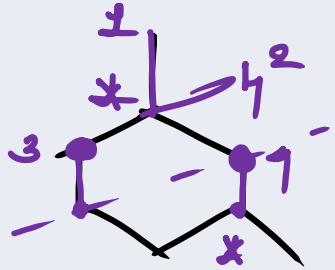


2 C.C X



2 C.C ✓
POS ✓

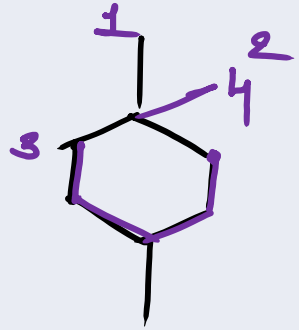
Yes

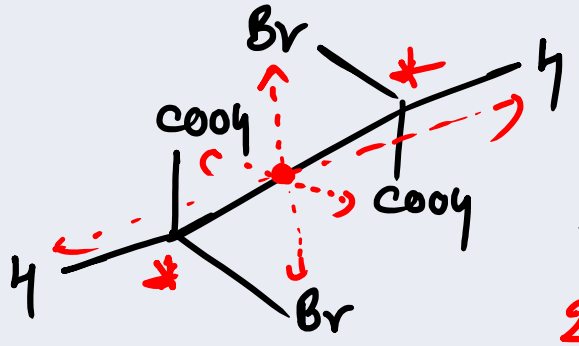


Yes

2 C.C X

Meso X





Meso

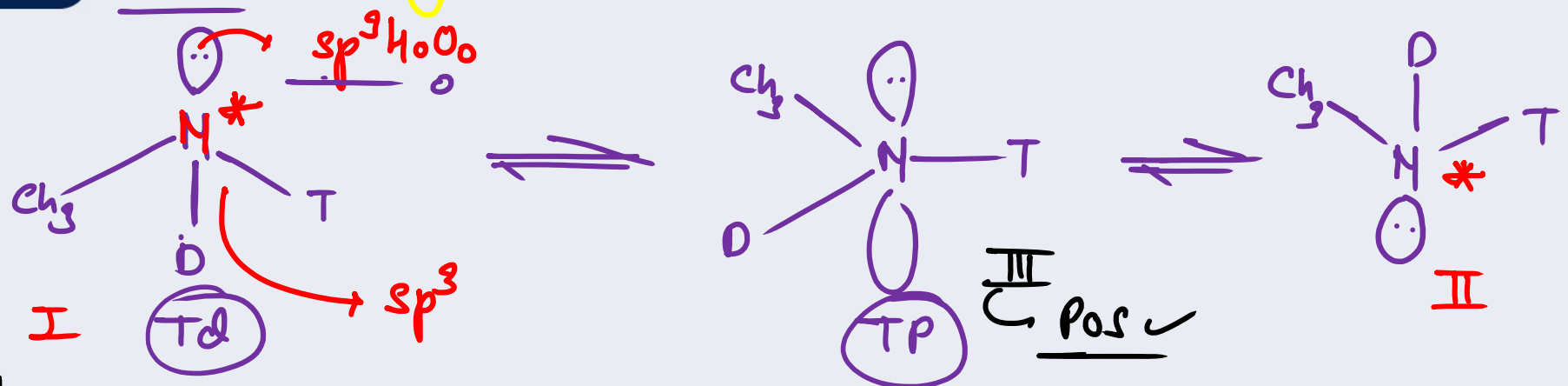
≡

2 C's ✓

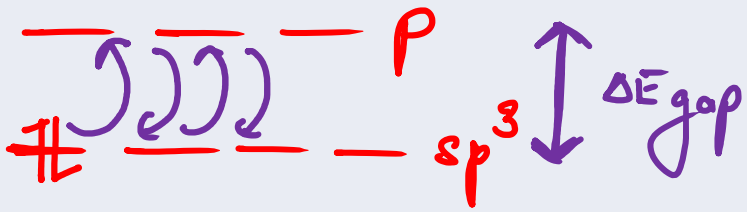
cos ✓

"Chirality in amines".

Walden inversion.



*

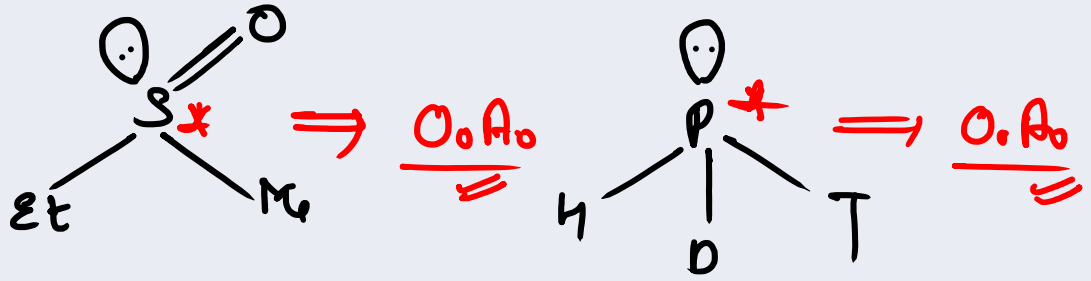


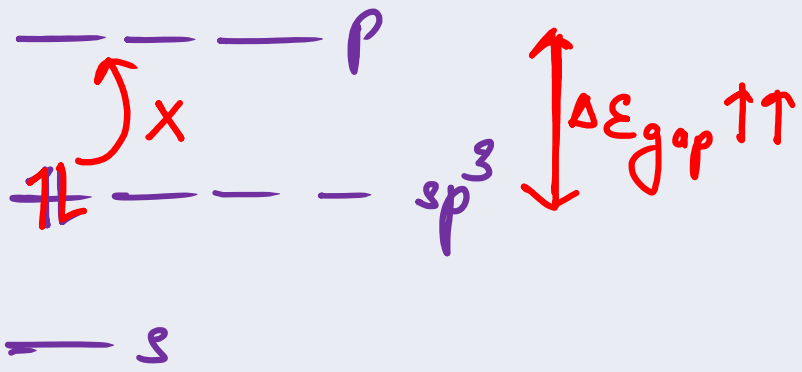
I – II Enantiomers Oᵒ Iᵒ

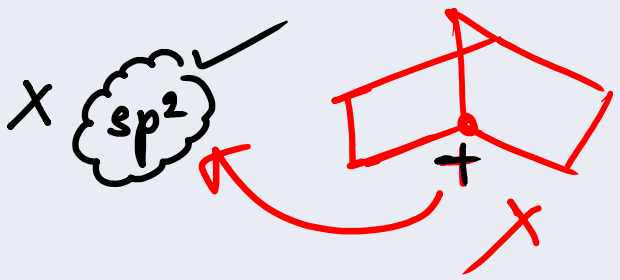
III = Pos ~ Oᵒ Iᵒ

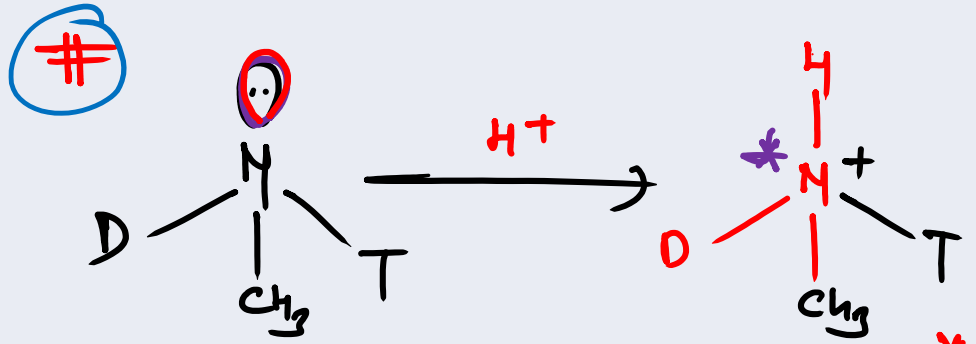
⇒ Oᵒ Iᵒ

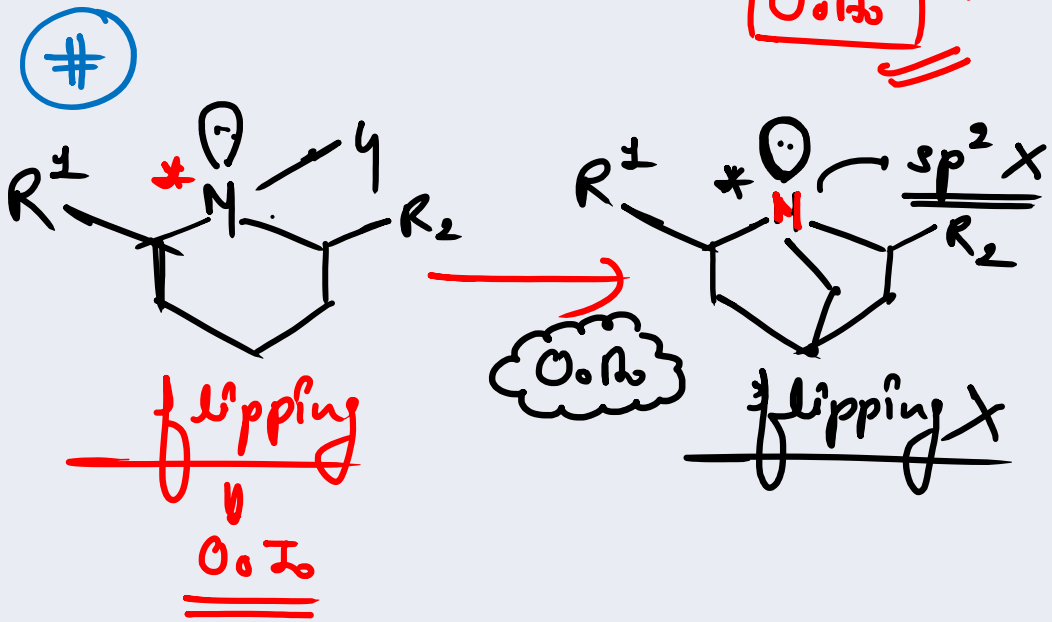
"Walden Inversion"

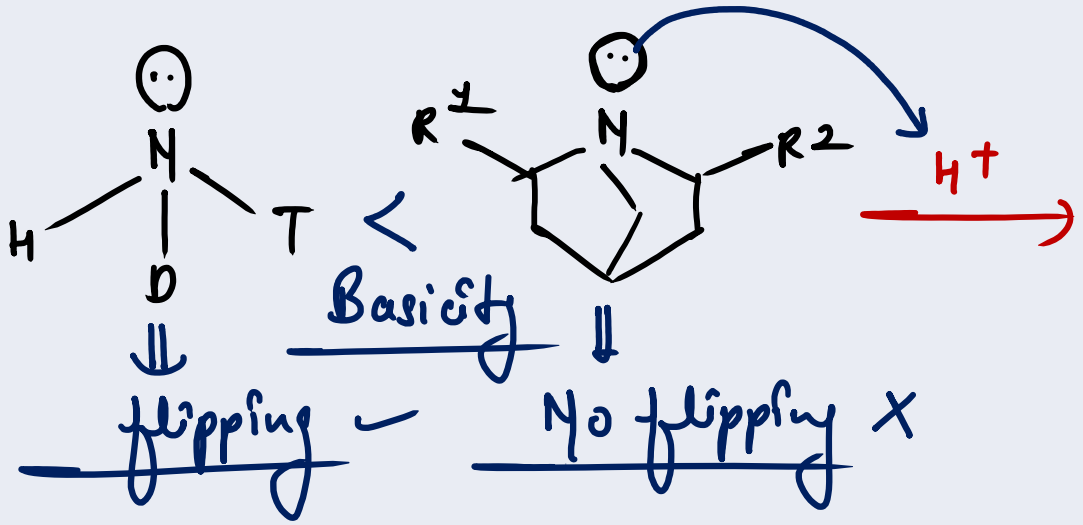

Et
Me
O.A.
H
D
T
O.A.


P
X
sp3
ΔEgap ↑↑
S


X
sp2
+
X


#
D
CH3
T
H+
H
D
CH3
T
O.A.
*

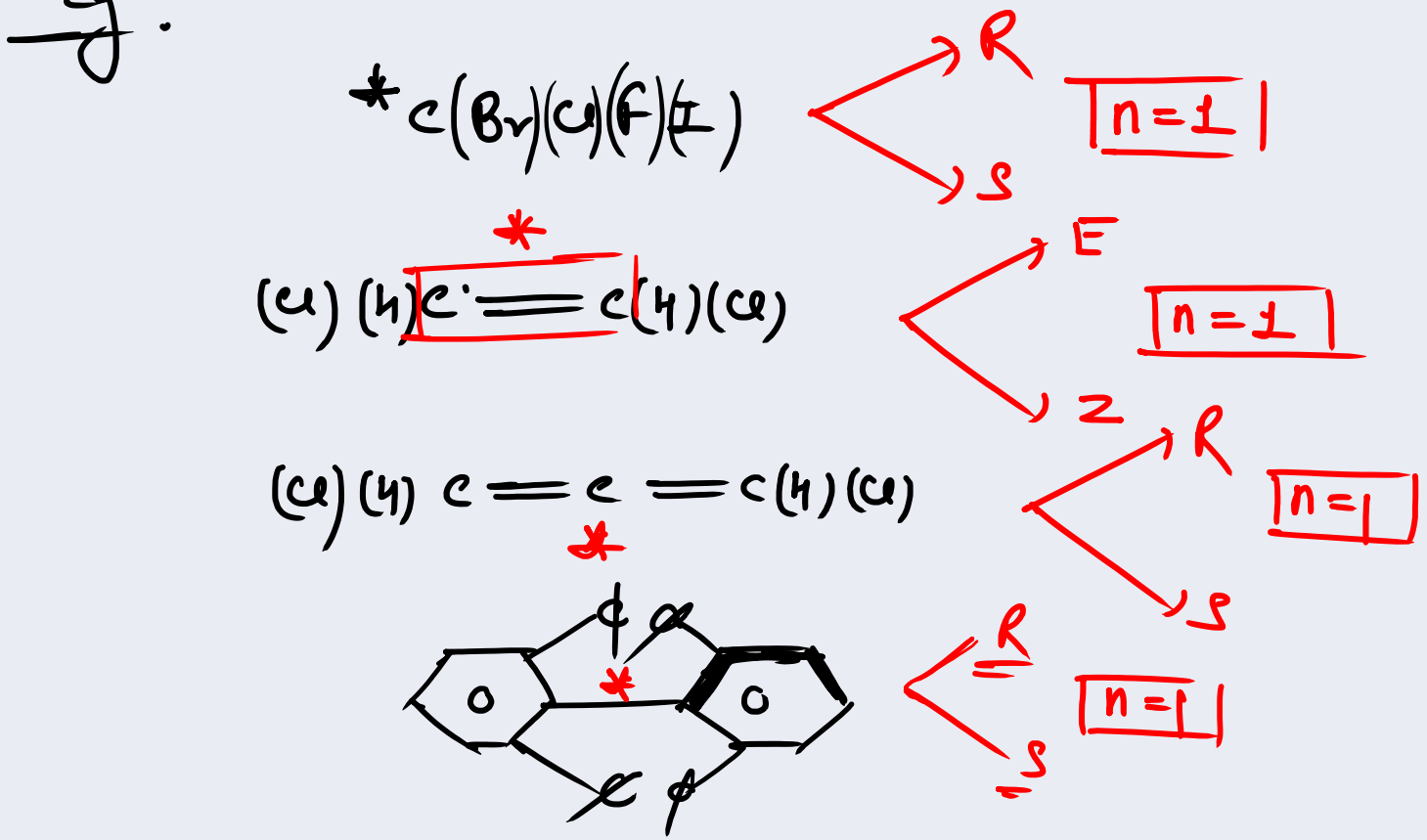

#
R1
R2
H
flipping
O.I.
O.A.
sp2
X
flipping X


H
D
T
N
R1
R2
N
H+
Basicity
flipping
No flipping X

Calculation of total no. of S.I.

* Stereogenic center (n) = Centers which can give two isomeric form are called as stereogenic center.

Eg.



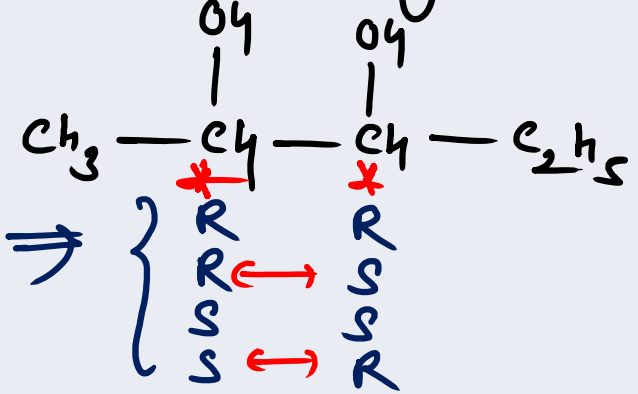
Molecules

- Symmetric
  - * Unsymmetrical
- Unsymmetrical

$\Rightarrow$ Total no. of S.I. $= 2^n$

No. of O.I. / Meso $= 0$

No. of Enantiomeric pairs $= \frac{2^n}{2} = 2$



$\Rightarrow 2^2 =$ "4"

Symmetrical

n

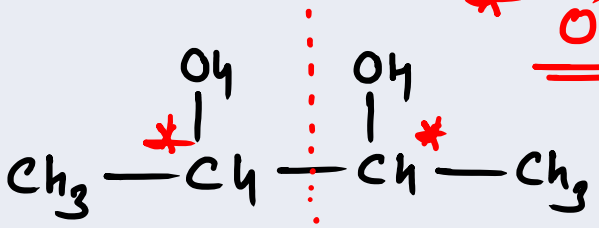
Even Odd

Even

Total no. of $S_o I_o$ = $2^{(\frac{n}{2}-1)}$ + $2^{(\frac{n}{2}-1)}$

* $O_o R_o$

* $O_o I_o$ / Meso



(n = 2)

$\Rightarrow$ Total no. of $S_o I_o$ = $2^{2-1} + 2^{\frac{2}{2}-1}$

$= 2^1 + 2^0$

$= 2 + 1$

$= 3$ ✓

odd

Total no. of stereoisomers = 2^{n-1}

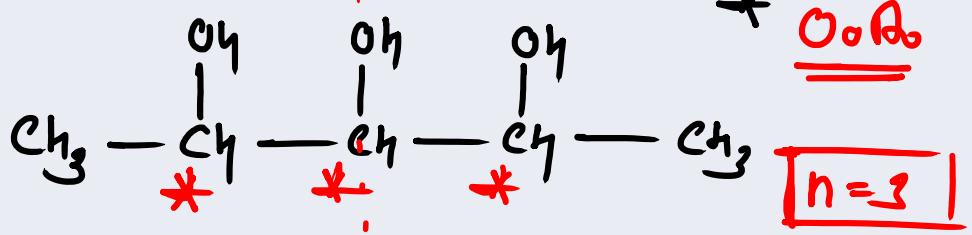
$\Rightarrow$ Total no. of SoI = $2^{n-1} - 2^{\frac{n-1}{2}} + 2^{\frac{n-1}{2}}$

2^{n-1} → * → OoR

$2^{\frac{n-1}{2}}$ → OoR

$2^{\frac{n-1}{2}}$ → OoI

PYQ



$n = 3$

$\Rightarrow$

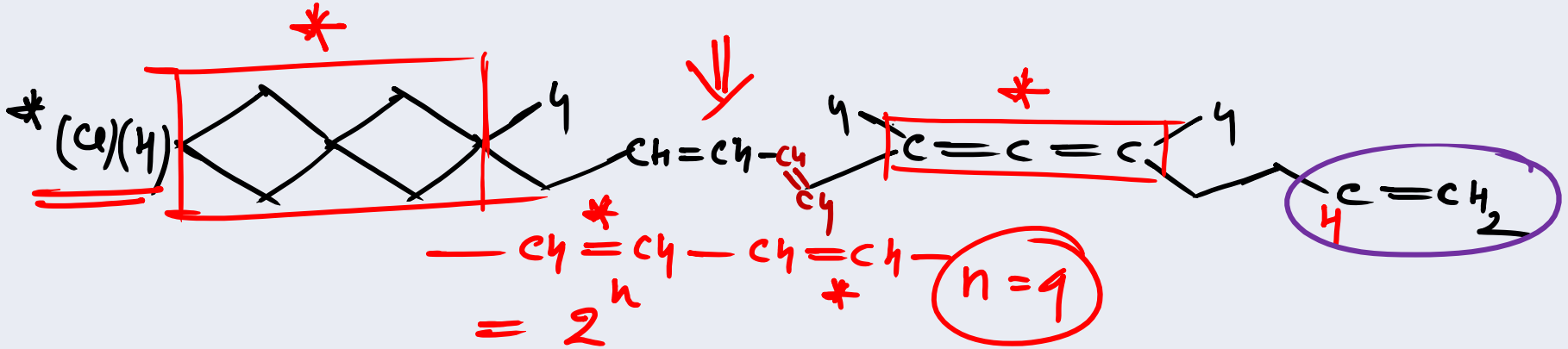
$\Rightarrow 2^{3-1} - 2^{\frac{3-1}{2}} + 2^{\frac{3-1}{2}}$

$2^2 - 2^1 + 2^1$

$4 - 2 + 2$

$= \underline{\text{OoR}}\ (2) + 2 = (1)^*$

Q4



$-CH=CH-CH=CH-$

$n = 4$

$= 2^n$

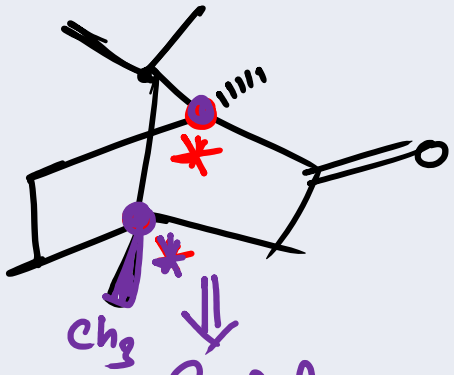
$= 2^4 = 2.2.2.2$

$= 16$ *

Q4

$CH_2=CH-C(OH)(H)-(H)C=C=C(H)-H\,C=C(H)(H)$

$2^3 = 8$



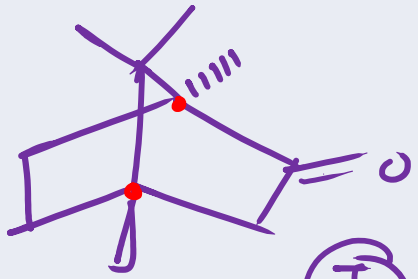
Rigid

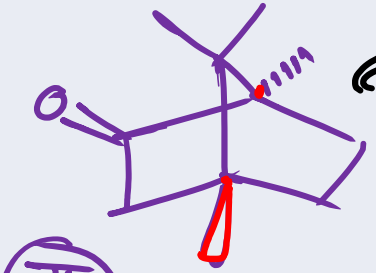
Total no. of S_0I_0 = ?

$2^2 = 4$

"Wrong"

#





PhD *

Interview

I

II

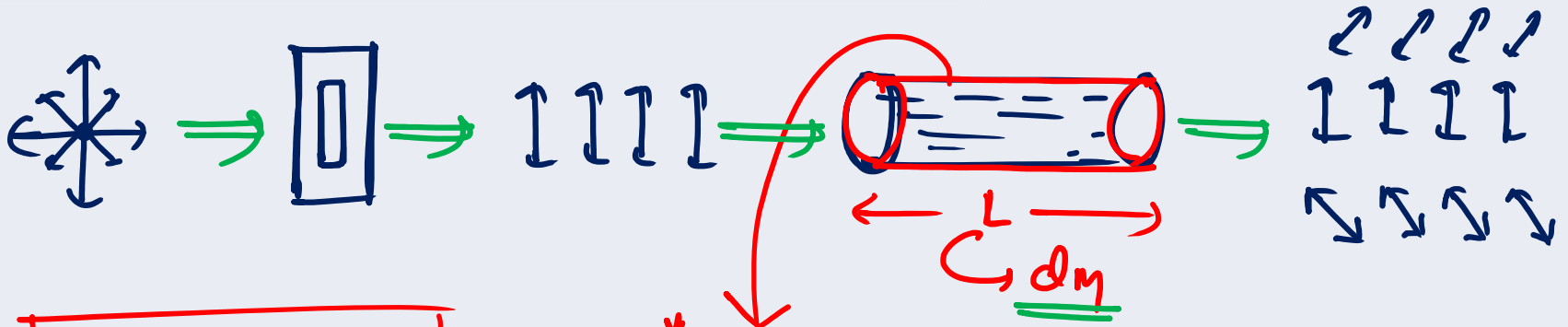
O_2

$S_0I_0 = 2$

*Node ⇒ If the compound is *Rigid + *Meso then it's total no. of

SoI would increase via (1)

Numerical



1 dm = 10 cm

* Conc^{n} g/mL

10 min *

$\theta \propto [conc]^{n} [L]$

$\theta = [\theta]\ conc^{n}\ [L]$

$\theta \equiv \alpha$

$\alpha = [\alpha]\ conc^{n}\ [L]$

$[\alpha] = \dfrac{\alpha}{[Conc^{n}][L]}$

$[Conc^{n}] = g\,mL^{-1}$ (dm

* Observed Rotation ⟸ Extensive.

* Specific Rotation ⟹ Intensive.

Type -01 *

20 mg of Mandelic acid was dissolved in 1 cm3 of ethanol. The observed rotation ά is -4.55°.When the solution is placed in a 10 cm of tube. Calculate the [ά] ?

$$\Rightarrow [\alpha] = \frac{\alpha}{\text{Conc}^n \times L}$$

Conc^n → $g\,ml^{-1}$; L → dm

$$\alpha = -4.55^\circ$$

$$\text{Con}^n = \frac{20\,mg}{1\,cm^3} = \frac{20 \times 10^{-3}\,g}{mL}$$

$1\,cm^3 = 1\,mL$ *

$1\,m^3 = 1000\,L$ *

$$[\alpha] = \frac{-4.55^\circ}{20 \times 10^{-3} \times 1\,dm}$$

g/mL

$$= \frac{-227.5^\circ}{0}$$

Conc^{n} = 0.1 M $\xrightarrow{mol\ L^{-1}}$ Mol. wt = 100 g mol^{-1}

= 0.1 mol L^{-1} × 100 g mol^{-1}

= 10 g L^{-1}

= 10 g 10^{-3} mL = 10^{-3} × 10 g mL^{-1} .

Type (11)*

Q) D-(+)-ά-pinine has [ά] = 51.5°. A sample of ά-pinine which has both d (+) and l (−) form has a specific rotation [ά] = 30.8°. The % of (+) Enantiomer in the solution ?

80% 20%

(+)* ⇒ $51.5^\circ = [\alpha]_+$ ‖ $[\alpha]_- = -51.5^\circ$

% (+) (−) ⇒ $[\alpha]_{sol^n} = 30.8^\circ$ *

$30.8^\circ = 51.5x + 51.5x$

$+ 51.5^\circ$

$82.3 = 103x$

$\alpha_{sol^n} = \alpha_d + \alpha_l$

$\Rightarrow [\alpha][conc^n]\,l = [\alpha]_d [conc]_d \cdot l + [\alpha]_l [conc^n]_l \cdot l$

Mole fract

$[\alpha] = 1$, $[conc^n] = 1$, $[\alpha]_d = 1$, $[conc]_d = x$, $[conc^n]_l = (1-x)$

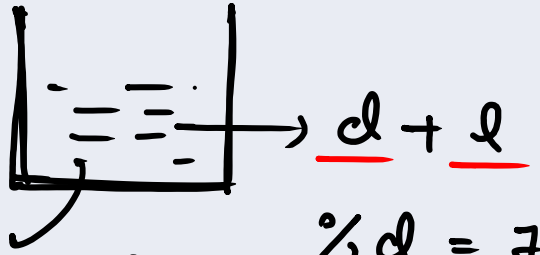
$\Rightarrow 30.8^\circ(1) = +51.5^\circ(x) - 51.5^\circ(1-x)$

$x = 0.799$

$\%x = 79.9\%$

* 80%

Type - III



d + l

$[\alpha]_d = +20^\circ$

% d = 70%

% l = 30%

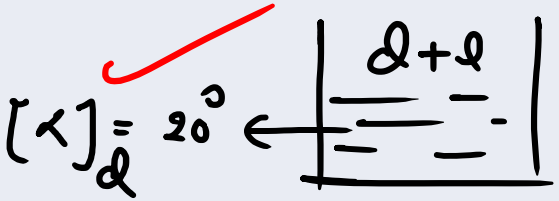
① Enantiomeric excess (ee) / Optical Purity ? 40%

= | % d − % l |

% d

② Observed Rotn ? = ee/o.p × specific Rotatn (% d)

$= \frac{40}{100} \times 20^\circ = 8^\circ$



$[\alpha]_d^{20}$ ←

Pure

% l = 60%

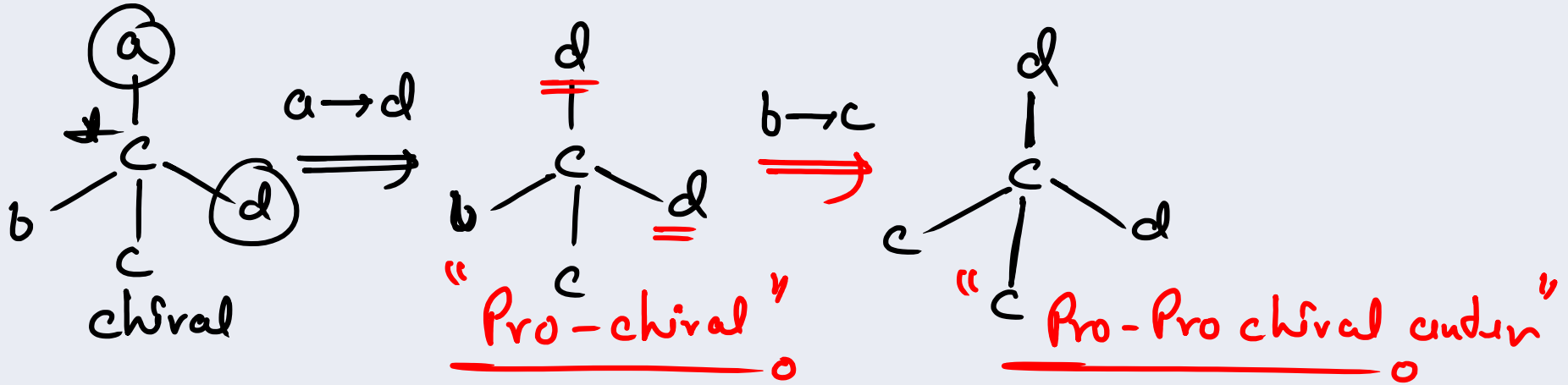
% d = 40%

① Optical purity or ee = ? 20% l

② * ORs = ?

$\frac{20}{100} \times -20^\circ = -4^\circ$

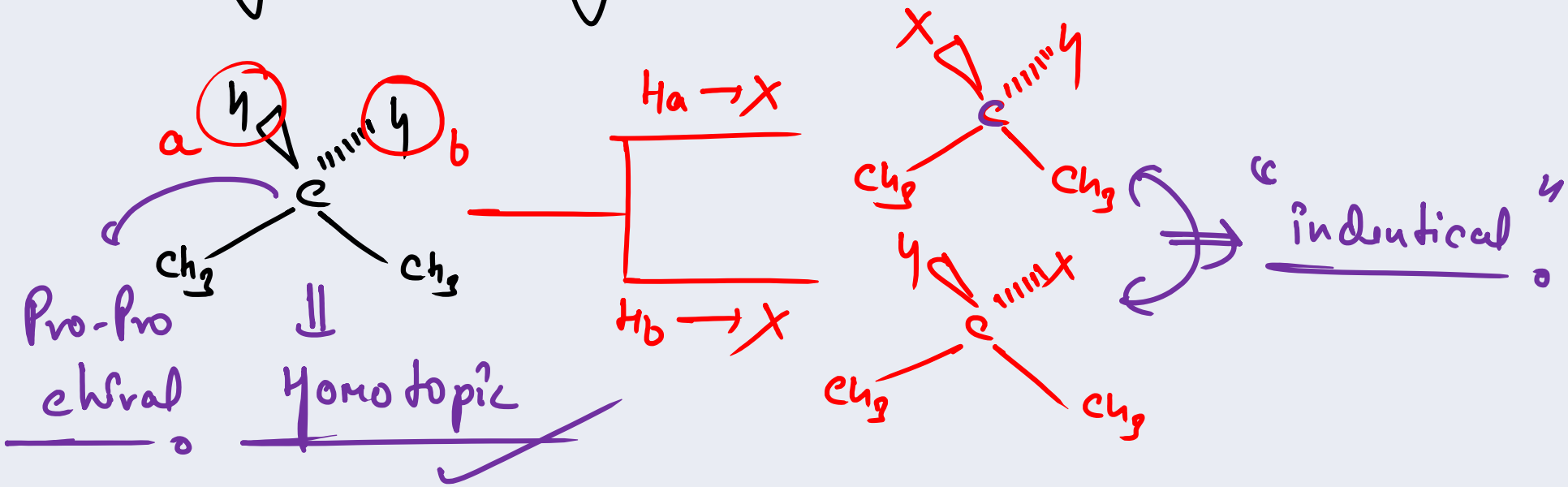
Topocity



Topocity

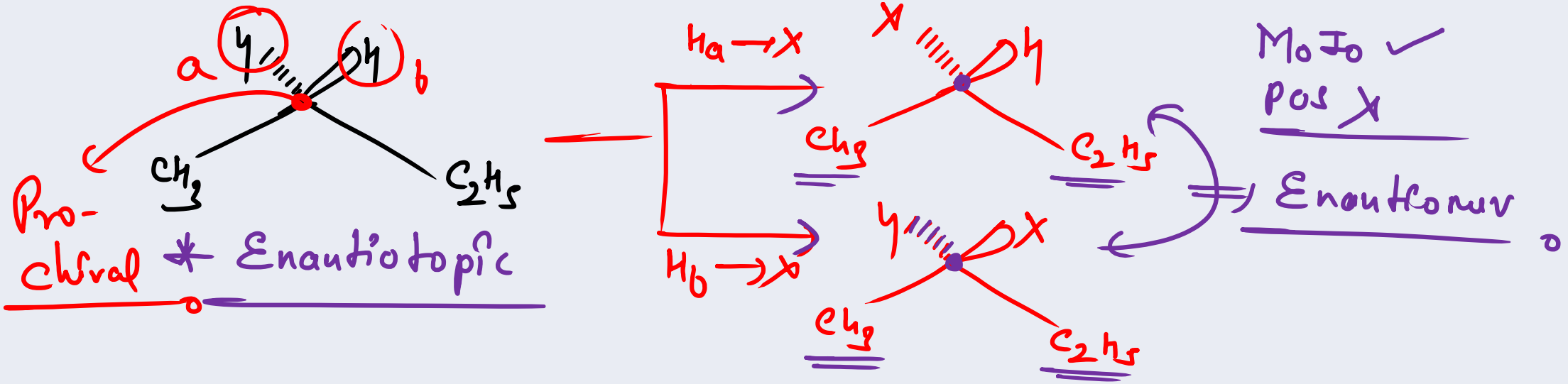
- Homotopic
  - * generally (Pro-Pro chiral)
- Heterotopic
  - * generally Pro chiral
  - 1) Enantiotopic
  - 2) Diastereotopic

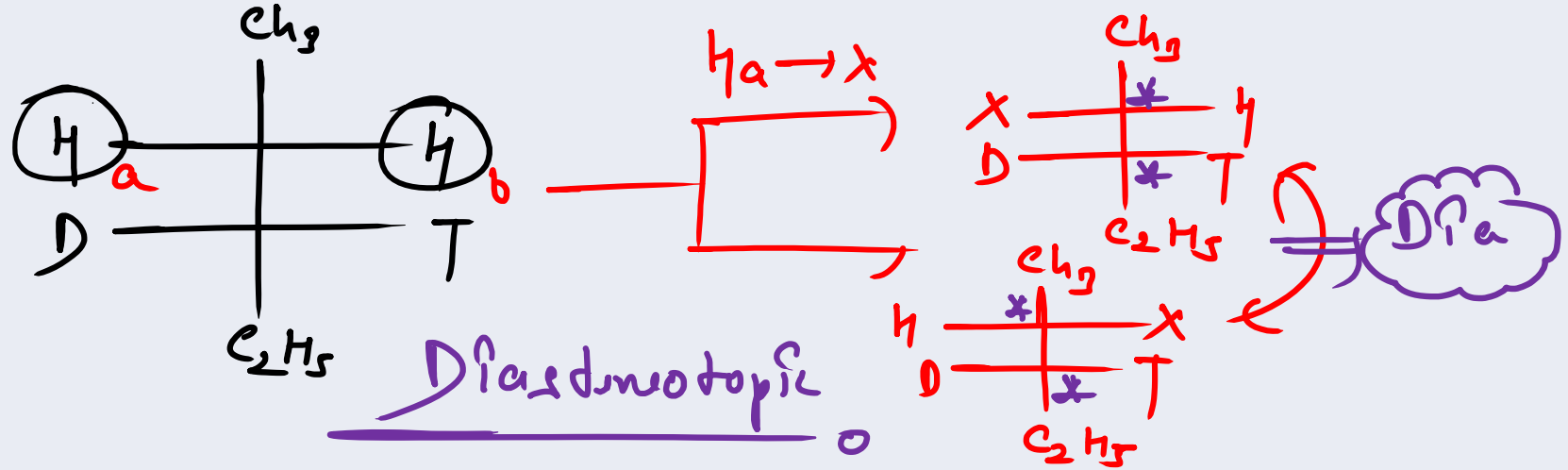
(1) Ligand Exchange method.



* (CH_3) — (CH_3) ≡ HOMOTOPIC.

Thank you :


a
H
OH
b
CH3
C2H5
Pro-
chiral
* Enantiotopic
Ha → X
Hb → X
X
H
CH3
C2H5
Y
X
CH3
C2H5
Mo Io ✓
Pos X
Enantiomer


CH3
H
a
H
b
D
T
C2H5
Diastereotopic
Ha → X
CH3
X
H
D
T
C2H5
CH3
H
X
D
T
C2H5
Dia