Study of no. of stereoisomers :-

If a molecule have –

① n different chiral centres, the no. of stereoisomers $= 2^n$.

$\overset{*}{C}A\overset{*}{B}\overset{*}{C}\overset{*}{D}$, if A, B, C, D chiral then centre atom also be chiral i.e. $\overset{*}{C}A\overset{*}{B}\overset{*}{C}\overset{*}{D}\overset{*}{}$ $= 2^5$

② If stereocentre are not different (this type of system is said degenarate system).

Ex : tartaric acid is AA system.

$HOOC\overset{*1}{C}H(OH)\overset{*2}{C}H(OH)COOH$

two different chiral centres are substituted identically i.e. AA system.

ABA → these are non-degenarate system (these are non identically substituted).

ABBA, ABCBA, ABCCBA, ABCDCBA, etc. are other system.

(1) If n is even :-

i. No. of chiral isomers (optically active) $= 2^{n-1}$

ii. No. of meso (i.e. achiral) $= 2^{\frac{n-2}{2}}$

Total no. of stereoisomers : $2^{n-1} + 2^{\frac{n+2}{2}}$

(2) If n is odd :- $(m = n)$

i. No. of stereoisomers including active and meso $= 2^{m-1}$

ii. No. of meso $= 2^{\frac{m-1}{2}}$

Total no. of active or chiral isomers $= 2^{m-1} - 2^{\frac{m-1}{2}}$

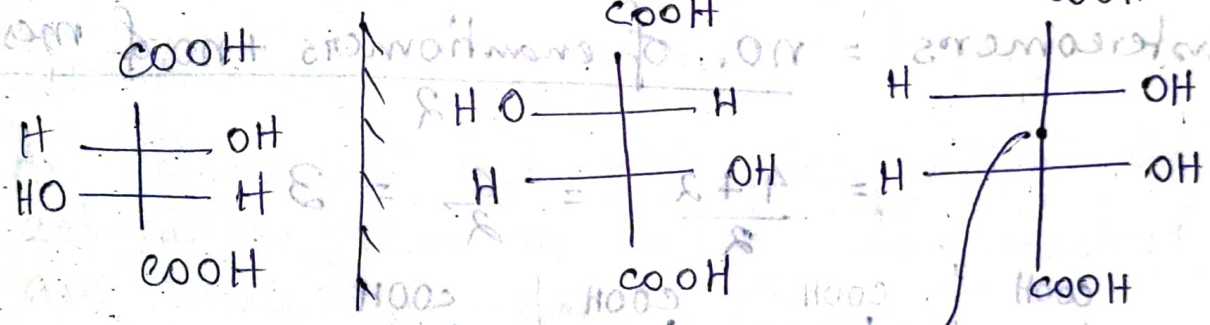
① AA system :-

HOOC $\overset{*}{C}$H OH $\overset{*}{C}$H OH COOH

$n = 2$ (even) Active isomers $= 2^{2-1} = 2$

No. of meso $= 2^{\frac{2-2}{2}} = 1$

∴ 2 chiral and 1 achiral



This point is on the plane of symmetry. ∴ achirotopic.

(2) ABA system :-

$HOOC\overset{*}{C}HOH\overset{*}{C}HOH\overset{*}{C}HOH\,COOH$ $\quad n = 3$ (odd)

∴ no. of stereo isomers $= 2^{3} = 4$

no. of meso $= 2^{\frac{3-1}{2}} = 2$

∴ No of active isomers $= 4 - 2 = 2$

∴ No of diastereomers $= \frac{\text{no. of enantiomers} + \text{no. of meso}}{2} = \frac{4+2}{2} = \frac{6}{2} = 3$