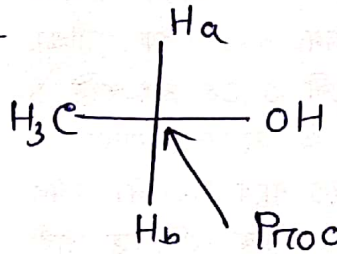
Prochirality & Prostereoisomerism

Topicity

(Class-2)

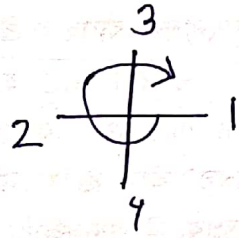
Pro-R, Pro-S Nomenclature :-

To name the enantiotopic ligands at Prochiral centre the ligand is to be labelled by arbitrarily assigned CIP rules,

eg 

Now if arbitrarily Ha is Preferred over Hb. then sequence is

HO > CH3 > Ha > Hb.

i.e 

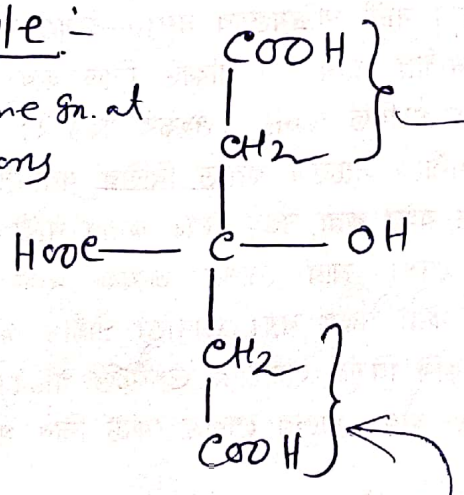
R → R (as 4 is below). i.e Prochiral centre is R.

So Ha is Pro-S ligand.

Similarly Hb will be Pro-'S' ligand.

Another example :-

(Here two same fn. at different positions are labelled).

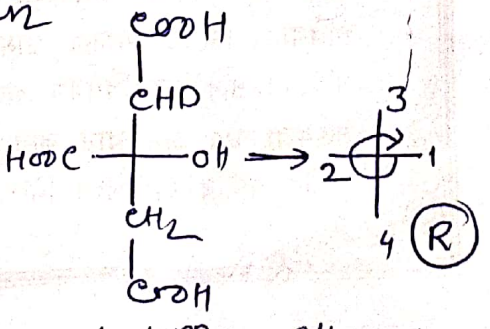


Label the 2nd bracket groups.

→ (Pro-R) ↓

Let - CH_2 → CHD

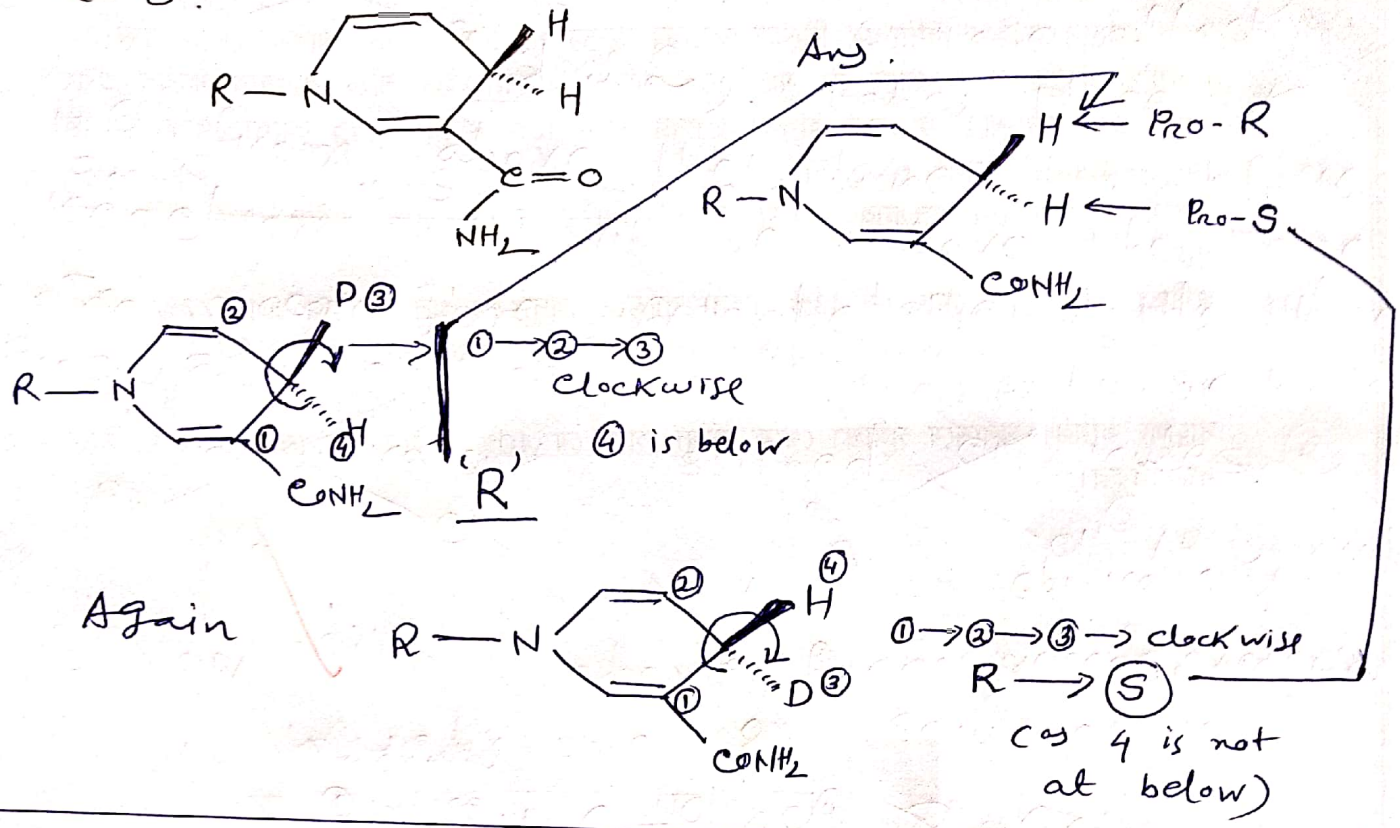
then



∴ upper CH_2COOH ligand is Pro-R

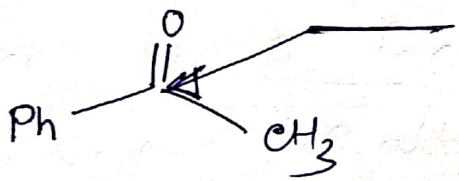
Similarly lower CH_2COOH group will be Pro-'S'

* Label the marked Protons by Pro-'R' or Pro-'S'.

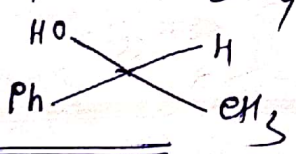


Re, Si Nomenclature :- The groups and faces in a molecule which are enantiotopic or diastereotopic are collectively termed as heterotopic or stereoheterotopic. In such cases the faces are named by 'Re' (Rectus means clockwise) or 'Si' (Sinister means anticlockwise).

This can be explained by taking ~~an~~ an example of following rexn.

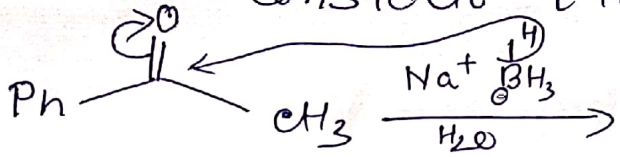


You know that this is Prochiral centre if it reacts $NaBH_4$ the Product will be chiral

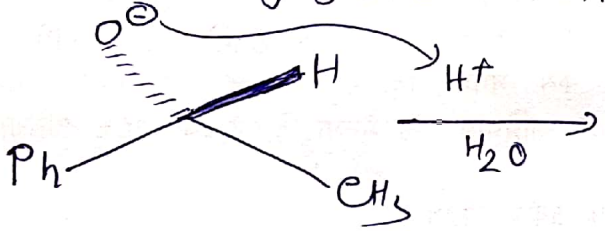


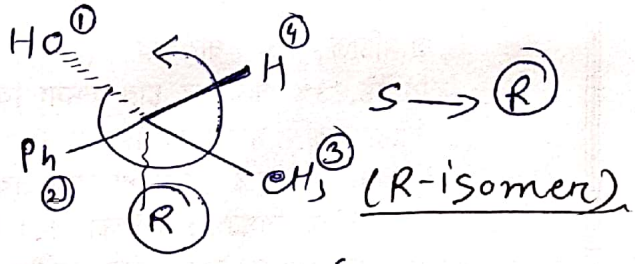
← This type.

Consider the molecule as.

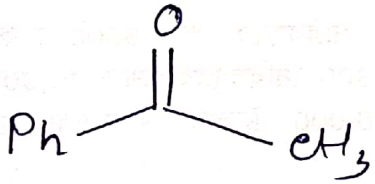


Suppose attack takes place by $H^{\ominus}$ from above the plane then after reaction H will be above the plane and oxygen will be below the plane

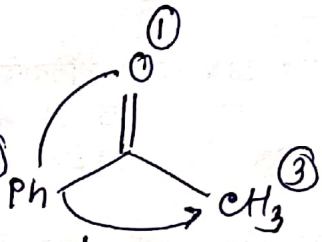




Now the above face is 'Si' or 'Re' which one ?

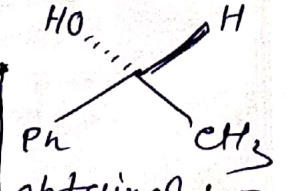


steps are: You have to put priority numbering around carbonyl carbon by ①, ②, ③ → see



Then you move ① → ② → ③

↳ Anticlockwise movement then it is 'Si' face. So above face is Si face and this pdt

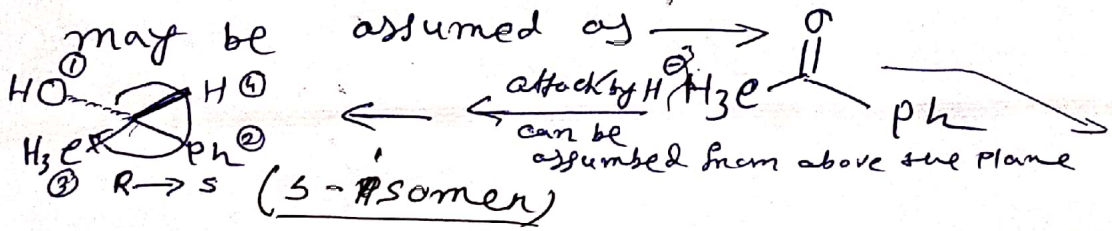


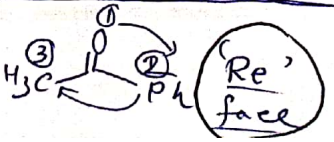
obtained by Si face attack.

So si face attack result R isomer and Re face attack result S isomer

∴ R and S are enantiomer So both Re and Si face here are enantiotopic face

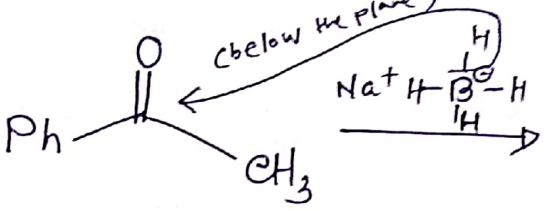
(*) Similarly if $HO^{\ominus}$ attacks from below the plane then the molecule may be assumed as →

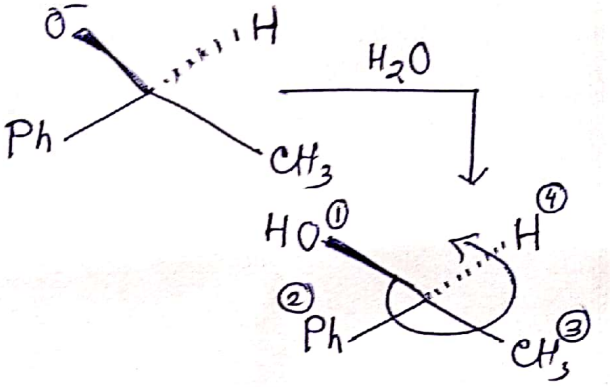




Alternative Process :-

Assume the molecule as before and attack $H^{\ominus}$ from below the plane





S → S

(as Priority 4 is below the Plane)

Now below face is Re or Si ?

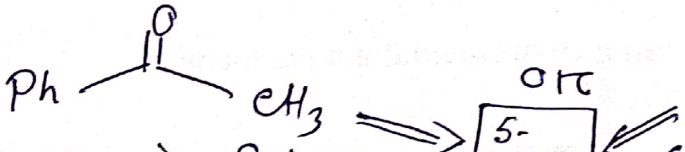
Then you have to view the molecule below the plane i.e. think you are underneath of your page, then you will see the molecule from the front as

① → ② → ③ Clockwise.

Re-face

Understand ?? what I am telling you

* Check in both cases 'S' pdt is obtained from Si face attack whether you imagine the molecule as



(if you imagine this then $H^{\ominus}$ attack will be from below the Plane)

(if you imagine this then $H^{\ominus}$ attack will be from above the Plane.