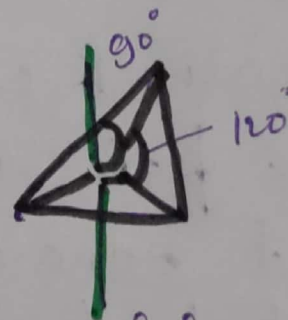
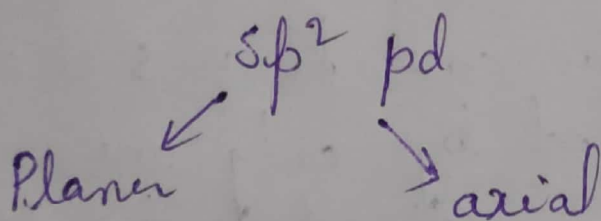


# Bent Rule of Hybridization

1) This rule given by the scientist Bent. This rule describe about position of electronegative element and lone pair in TBP geometry of a molecule. According to this rule:-

2) More electronegative element in TBP structure occupies axial position because axial position have lesser s character and greater p character. This can be proved as given below. TBP structure has  $sp^3d$  hybridization. which can be written as



% s character in Planar condition

$$\cos \theta = \frac{s}{s-1}$$

$$\cos 120^\circ = \frac{s}{s-1}$$

$$-\frac{1}{2} = \frac{s}{s-1}$$

$$-2s = -s+1$$

$$2s = 1-s$$

$$2s+s=1$$

$$3s=1$$

$$\therefore s = \frac{1}{3} = 0.33, \text{ or } 33.33\% \text{ s character.}$$

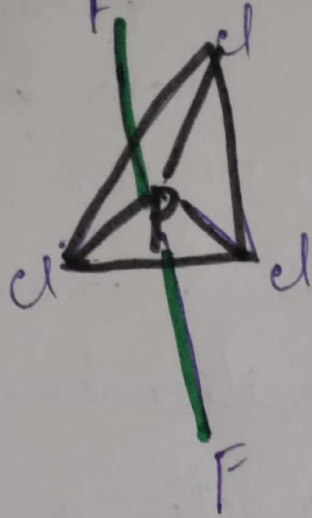
axial condition

$$\cos \theta = \frac{s}{s-1}$$

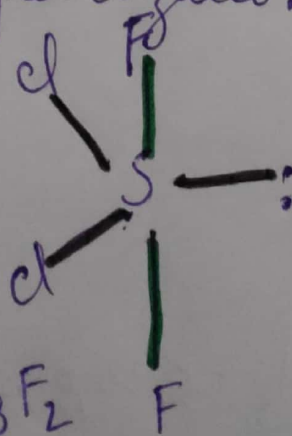
$$\cos 90^\circ = \frac{s}{s-1}$$

$$0 = \frac{s}{s-1} = 0 \text{ s character}$$

eg:-  $PCl_3F_2$ . This molecule has TBP structure  
 F is more electronegative than Cl. Therefore  
 F occupies axial position and Cl occupies  
 equatorial position.



2) Lone pair present in a molecule having  
 TBP structure occupy equatorial position,  
 because on equatorial position there is  
 greater p character and less s character.  
 Lone pair attracted by only one nucleus  
 and bonded pair attracted by two nuclei  
 central atom tightly kind lone pair on  
 equatorial position to take molecule stable.  
 eg:-  $SF_4$ , hybridization  $sp^3d$ .

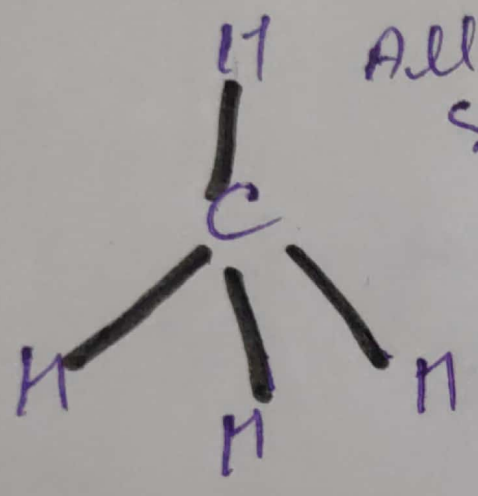


lone pair on  
 equatorial position

Bent Rule of Hybridization

3) One increasing %s character in hybrid orbital, the bond length decrease bond angle increases.

eg:- Explain C-H bond length longer than C-F bond length



CH<sub>4</sub>

All sp<sup>3</sup> hybrid orbital with equal bond length.



CH<sub>3</sub>  
↑ %s character increases length

Modified Bent Rule