

Class - B.Sc. Part I (subsidiary)

Subject - chemistry

Topic - Hybridisation

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Hybridization

Hybridization is the merger of orbital on atom having nearly equal energy to produce entirely a new orbital having same energy contain identical shape and Symetrically disposed in a space.

In the case of Carbon there are three types of hybridization. Discuss as below:-

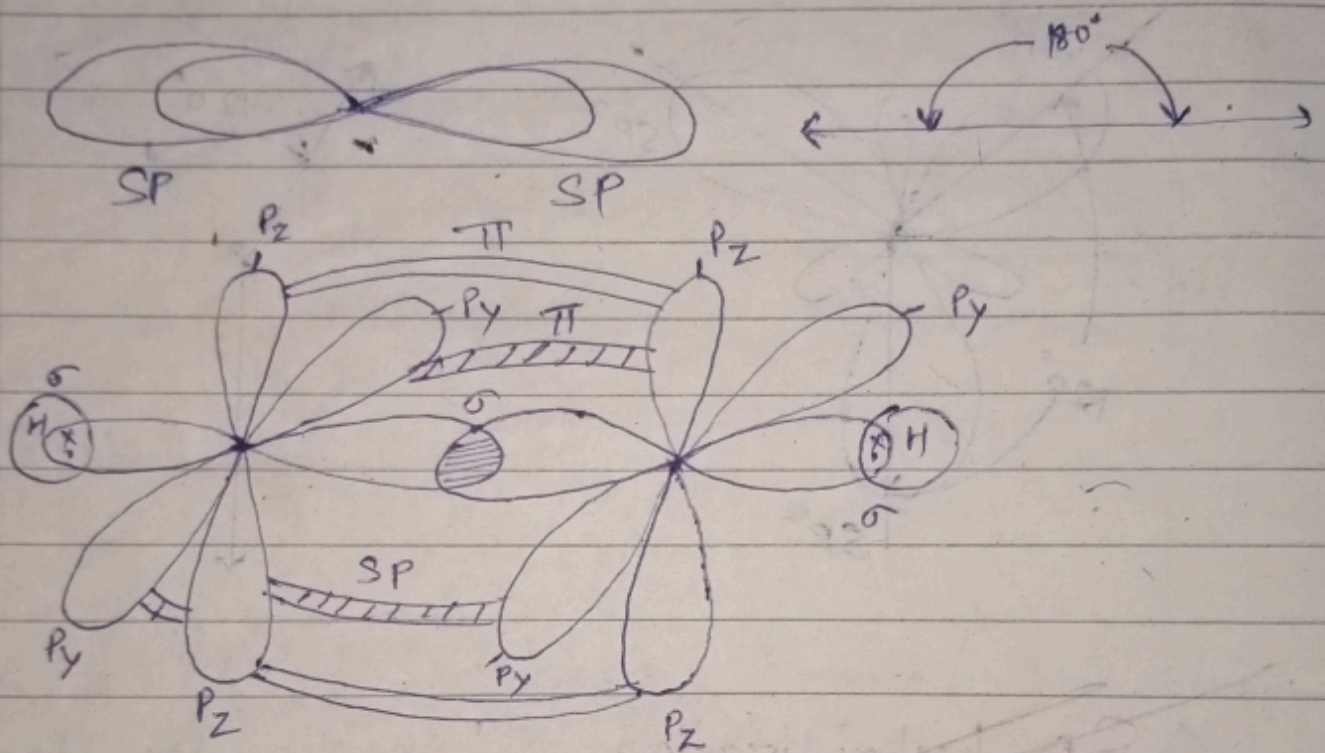
Sp hybridization \rightarrow

In this hybridization s and p orbitals take part in hybridization to form two co-linear orbitals while the two p orbitals of excited carbon atom remain unhybridized and these lie perpendicular to the plane of hybrid orbital.

For e.g. 1 — In the formation of acetylene (C_2H_2) : —

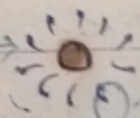
One hybrid orbital to two orbitals each overlap linearly forming σ bond and rest of one hybrid orbital overlap with two orbitals of two hydrogen atom forming two sigma (σ) bond and two unhybridized that is p_y and p_z overlap ~~side~~ side wise with the unhybridized orbital p_y and p_z with

Other Carbon atom forming two $P\pi$ (π) bond.



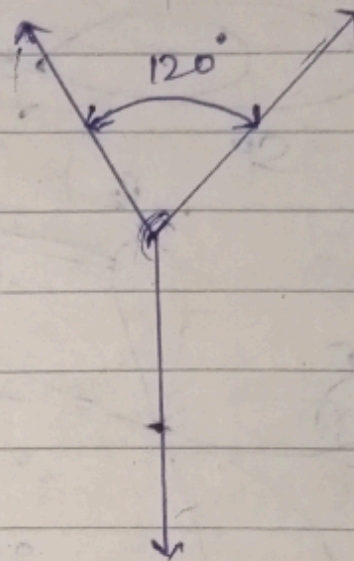
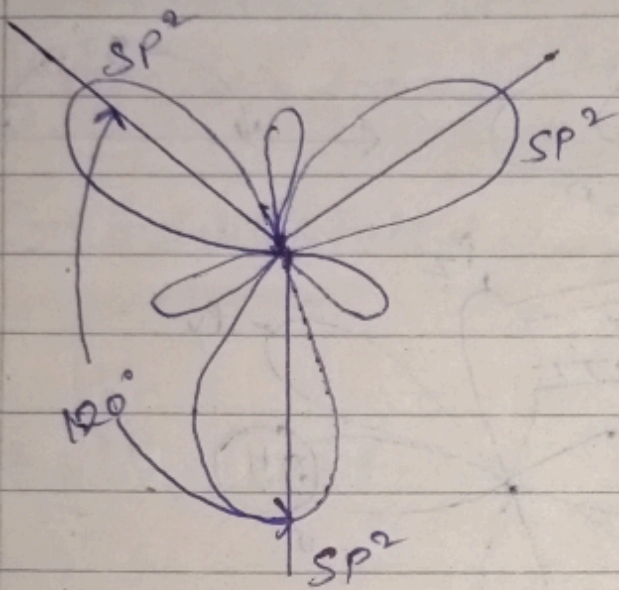
Sp^2 hybridization : \rightarrow In this hybridization 2s, 2p_x and 2p_y orbitals take part to form three Sp^2 hybrid orbitals which are planar and have constituent and an angle of 120° . They are directed towards the equilateral. It has following characteristics \rightarrow It takes place in a compound $C=C$, Bond length 134 pm and Bond angle $= 120^\circ$.

For e.g. : \rightarrow In the formation of ethylene (C_2H_4) :



One hybrid orbital of two carbon atom which overlap linearly forming σ (sigma) bond between them. Now rest of the unhybridized hybrid orbital of two carbon atom overlap sidewise to form four π orbital to

four hydrogen atom giving rise to ethylene molecules.



(1) Sp^3 hybridization : — In this hybridization $2s$, $2p_x$, $2p_y$ and $2p_z$ Orbitals takes part to form four Sp^3 hybrid Orbital which are identical and have equal energy angle of $109^\circ 28''$. They contain One electron each further. They are represented by the Carbon of the tetra hydral.

It has following characteristics, They contain in a compound $C-C$ (Carbon single bond carbon), Bond length — 154 \AA . and Bond angle $109^\circ 28'$. It slope is twine bounded in which One lobe is much larger than the other.

