UNIT 4

CHEMICAL BONDING AND MOLECULAR STRUCTURE

Different types of hybridization involving s, p and d orbitals can be explained as below.

sp hybridisation:

Mixing of one 's' orbital and one 'p' orbital (p_z) to form two sp hybrid orbital.

- Each sp hybrid orbital have 50% s-character and 50% p-character.
- The sp hybrid orbitals point in the opposite direction giving linear geometry.

Ex. $BeCl_2$ molecule

Be – Ground state – $1s^2 2s^2$

Excited state – $1s^2 2s^1 2p^1$

- s & p orbitals inter mix to form two sp hybrid orbitals.
- The two sp hybrid orbitals overlap with p-orbitals of chlorine atom axially to form $BeCl_2$ molecule.

sp^2 hybridisation:

Mixing of one 's' orbital and two p – orbitals to form three sp^2 hybrid orbitals.

- Each sp^2 hybrid orbital have 33.3% s – character and 62.6% p-character.
- sp^2 hybrid orbitals arrange in space to give planar geometry.

Ex. BCl_3 molecules

B – Ground state $1s^2 2s^2 2p^1$

$1s^2\ 2s^1\ 2p_z^1\ 2p_y^1\ 2p_x^0$

Excited state

- s, p_y & p_z orbitals intermix to form sp^2 hybrid orbital with planar geometry.
- The three hybrid orbitals of boron intermix with ‘p’ orbitals of chlorine to form BCl_3 molecule.

ometry of PCl5 molecule