

Valence bond theory:

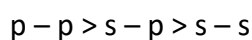
The basis of VBT is Schrodinger's wave equation i.e. wave mechanics. It explains shapes of covalent molecules & strength of covalent bonds.

- This theory was proposed by Hietler & London and developed by pauling & slater.

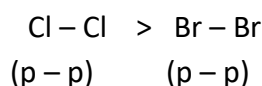
Postulates: A bond is formed by the overlapping of two half-filled orbitals of two atoms.

- The e^- s in the overlapping orbitals must be with opposite spins.
- Strength of covalent bond will depend on the extent of overlapping i.e., greater the extent of overlapping, stronger is the bond formed & vice versa.
- The direction in which overlapping orbitals are concentrated, the bond is formed in that direction. This explains directional nature of covalent bond & shape of orbital.
- The molecule will be stable because the bonding electron density is in consideration along the inter nuclear axis & that electron density keeps the two atoms attracted to each other.

The extent of overlapping will depend on size of atom & nature of orbital.



- Smaller atoms involve in greater overlapping.



(σ) Sigma bond	(π) Pi BOND
1) It is a strong covalent bond formed by overlapping along internuclear axis.	It is a weak covalent bond formed by the side wise or lateral overlapping
2) It involves head on (or) end – on – end overlapping.	It involves lateral & sidewise overlapping above & below the axis.
3) The bonding electron density is symmetrical & lies along the axis	Pi electron density lies above & below the axes.
4) Sigma bond is formed by overlapping of any two half filled orbitals (s - s, s - p, p - p)	It is formed by the overlapping of p – p or p – d orbitals.
5) It can be formed by pure valence orbitals or hybrid orbitals.	It is formed by only pure valence orbitals.
6) If s orbital is involved in overlapping, the bond formed is always sigma.	If p-orbital is involved in overlapping, it may be sigma or pi
7) The first formed bond between two atoms is always sigma bond. Sigma has Independent existence	It is formed only after the formation of sigma bond. It has no Independent existence
8) It determines the geometry of molecules	It has no role in determining geometry of molecules.
9) One of the two lobes is involved in over lapping	Both the lobes of p - orbital are involved in bond formation

10) Free rotation of orbitals is possible around sigma bond.	Free rotation of orbitals is restricted
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All single bonds are sigma bonds

- In double bond, one σ and one π bonds are present.
- In triple bond, one σ & 2 π bonds are present.

Eg: CH_4 4 σ and 0 π

N_2 1 σ and 2 π

O_2 1 σ and 1 π