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STRUCTURE AND BONDING ASSIGNMENT 2.

1. **Hybridization** is the idea that atomic orbitals fuse to form newly **hybridized** orbitals, which in turn, influences molecular geometry and bonding properties. **Hybridization** is also an expansion of the valence bond theory.
2. Salient features of hybridisation:

1)Hybridisation give rise to atomic orbitals with equal properties like energy and shape.

2)Hybridisation always occur between the orbitals of almost equal energy and they are in outer shell.

3)Hybridised orbitals always forms sigma bond.

4)Bond length of bond formed hybridised orbitals is always equal.

5)Bond energy of bond formed hybridised orbitals is large.

3. **Conditions of Hybridization**

(i) Only the orbitals present in the valency shell get hybridized.

(ii) Both filled and half-filled orbitals get hybridized.

(iii) The energy difference between orbitals undergoing hybridization should be small.

(iv) Promotion of electrons is not a must before hybridization takes place.

(v) Hybridization takes place at the time of bond formation only.

4. Covalent Strong Bond

Ionic Moderate Bond

Hydrogen Weak.

5. sp Hybridization

sp hybridization is observed when one s and one p orbital in the same main shell of an atom mix to form two new equivalent orbitals. The new orbitals formed are called**sp hybridized orbitals.**It forms linear molecules with an angle of 180°

* This type of hybridization involves the mixing of one ‘s’ orbital and one ‘p’ orbital of equal energy to give a new hybrid orbital known as an sp hybridized orbital.
* sp hybridization is also called diagonal hybridization.
* Each sp hybridized orbital has an equal amount of s and p character, i.e., 50% s and p character.
* All compounds of beryllium like BeF2, BeH2,BeCl2
* All compounds of carbon-containing triple bond like C2H2.

sp2 Hybridization

**sp2 hybridisation**is observed when one s and two p orbitals of the same shell of an atom mix to form 3 equivalent orbital. The new orbitals formed are called**sp2 hybrid orbitals.**

* sp2hybridization is also called trigonal hybridization.
* It involves mixing of one ‘s’ orbital and two ‘p’ orbital’s of equal energy to give a new hybrid orbital known as sp2.
* A mixture of s and p orbital formed in trigonal symmetry and is maintained at 1200.
* All the three hybrid orbitals remain in one plane and make an angle of 120° with one another. Each of the hybrid orbitals formed has 33.33% s character and 66.66% ‘p’ character.
* The molecules in which the central atom is linked to 3 atoms and is sp2 hybridized have a triangular planar shape.

Examples of sp2 Hybridization

* All the compounds of Boron i.e. BF3, BH3
* All the compounds of carbon containing a carbon-carbon double bond, Ethylene (C2H4)

sp3 Hybridization

When one ‘s’ orbital and 3 ‘p’ orbitals belonging to the same shell of an atom mix together to form four new equivalent orbital, the type of hybridization is called a **tetrahedral hybridization or sp3**. The new orbitals formed are called**sp3 hybrid orbitals.**

* These are directed towards the four corners of a regular [tetrahedron](https://byjus.com/regular-tetrahedron-formula/) and make an angle of 109°28’ with one another.
* The angle between the sp3 hybrid orbitals is 109.280
* Each sp3 hybrid orbital has 25% s character and 75% p character.
* Example of sp3 hybridization: ethane (C2H6), methane.

6. A sigma bond is a covalent bond which is formed by the head on overlap of two atomic orbitals. The combination of overlapping orbitals can be s-s, s-pz or pz-pz. Sigma bonding can be a bonding interaction or an antibonding interaction. Bonding interaction results by the overlapping of two atomic orbitals in the same phase whereas antibonding interaction occurs by the overlapping in opposite phase WHILE A Pi bond is a covalent bond which is formed by the side-to-side overlap of two atomic orbitals. The atomic orbital combinations can be px-px or py-py. Similar to the sigma bonding, a pi bond can be bonding or antibonding.