Chemical Bonding Terms

Hybridization is a concept in chemistry where atomic orbitals mix to form new hybrid orbitals with equivalent energy and shape, which are used to form covalent bonds. It helps explain the geometry and bonding properties of molecules. Below are key types of hybridization with examples:

1. sp Hybridization

- **Description**: One s orbital and one p orbital mix to form two equivalent sp hybrid orbitals.
- **Geometry**: Linear
- **Bond Angle**: 180°
- **Example**: $BeCl_2$, CO_2, C_2H_2 (acetylene)

2. sp^2 Hybridization

- **Description**: One s orbital and two p orbitals mix to form three equivalent sp^2 hybrid orbitals.
- **Geometry**: Trigonal planar
- **Bond Angle**: 120°
- **Example**: BF_3, BCl_3, C_2H_4 (ethylene)

3. sp^3 Hybridization

- **Description**: One s orbital and three p orbitals mix to form four equivalent sp^3 hybrid orbitals.
- **Geometry**: Tetrahedral
- **Bond Angle**: 109.5°
- **Example**: CH_4 (methane), NH_3, H_2O

4. sp^3d Hybridization

- **Description**: One s orbital, three p orbitals, and one d orbital mix to form five sp^3d hybrid orbitals.
- **Geometry**: Trigonal bipyramidal
- **Bond Angle**: 90°, 120°
- **Example**: PCl_5

5. sp^3d^2 Hybridization

- **Description**: One s orbital, three p orbitals, and two d orbitals mix to form six sp^3d^2 hybrid orbitals.
- **Geometry**: Octahedral
- **Bond Angle**: 90°
- **Example**: SF_6

General Features of Hybridization:

- The number of hybrid orbitals formed equals the number of atomic orbitals mixed.
- Hybrid orbitals are more effective in forming bonds than the original atomic orbitals.
- The geometry of a molecule depends on the type of hybridization.