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Soch Badlo by MAK

Ch03: Chemical Bond

Electronegativity: Chemical property that describes the tendency of an atom to attract electrons towards to itself.

Relations:
- ↳ Size of atom (inverse)
- ↳ Nuclear charge (Direct)
- ↳ Screening of electrons (inverse)

Trends:
- ↳ Group → Decrease
- ↳ Period → Increase

Dipole moment: Product of magnitude between the distance of positive and negative charges. SI unit: debye (1 debye is equal = 3.335×10^{-30} Cm)

Polar C-B: Type in which electrons aren't equally shared.

Non-Polar: Equal sharing of electrons

*Only those molecules that have non-polar covalent bond have shapes. (Tetrahydral, Linear, Trigonal etc).

Theories To explain Bonds

1. Octect rule
2. VSEPR (Valence Shell Electron pair Repulsion Theory)
3. VBT (Valence Bond Theory)
4. MOT (Molecular Orbital Theory)

Bond length: Distance between the nuclei of two atoms. (A°)

VSEPR Determine the shape and bond angle in the molecule. (Depends on lone and bond pair).

Shapes: A = Central atom, X = Bond pair, E = lone pair
- AX_2 → Linear Shape (180°-Bond angle) (BF_2)
- AX_3 → Trihydral shape (120°-Bond angle) (BCl_3)
- AX_4 → Tetrahydral (109.5°-Bond angle) (CH_4)
- AX_2E_2 → Angular (104.5°-Bond angle) (H_2O)
- AX_3E_1 → Trigonal (109.5°-Bond angle) (NH_3)
- AX_5 → Trigonal bipyramedal shape (90°-120°-Bond angle) (PCl_5)
- AX_6 → Octahedral (90°-Bond angle) (SF_6)

Importance:
- → VSEPR helps to identify the 3D shape of drugs.
- → VSEPR guides the design of drugs with shapes that precisely fit into enzymes active site.

Octect hypervalency: 2nd row of the periodic, where a full valence shell include 8 electrons with an electronic configuration.

VBT: Describes that covalent bonds are formed by the overlapping of partially filled atomic orbital with another partially filled atomic orbital.

Proposed by Heitler and London (1927)

↳ Bond is formed by the overlapping of atomic orbitals.

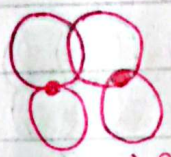
↳Electrons of overlapping orbitals has opposite spin.
↳Number of bonds formed = Unpaired electrons in the outermost shell.
↳More overlapping result in stronger bond.

Overlapping if's

Head to head → Sigma bond (σ)

S-S: S orbital + S orbital
P-P: P orbital + P orbital
S-P: S orbital + P orbital

Lateral → Pi bond (π)



Sigma bond is stronger than pi bond.

MOT: Describe that atomic orbitals combine to form molecular orbitals.

Proposed by Hund and Mulliken in 1932.

Paramagnetic: Unpaired electrons attracted by external magnetic field.

Dimagnetic: Not attracted by external magnetic field that have no unpaired electrons.

Molecular Orbital

Bonding (B.M.O) — Constructive, High energy, No nodal plane

Anti-bonding (A.B.M.O) — Destructive, low energy, Have nodal plane

Bond order: Total number of bonds formed when atomic orbitals overlap.

(If B.O is 0 then molecule is unstable).

↳MOT tells the nature of atom/molecule (Para or dimagnetic).

↳Molecular orbitals have different shape and energy a.c.t atomic orbitals.

Hyberdization: Mixing of two orbitals.

(Hybird = mix)

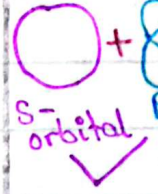
↳ground state electrons are transported to excited state (lower to higher).

Types:

Sp hyberdization:
- 50% s, 50% p orbitals
- Can form only sigma bonds.
- Ex: $BeCl_3$, Acetylene,

sp^2 hyberdization:
- 33.3% s, 66.6% p
- Ex: BCl_3, Ethylene

sp^3 hyberdization:
- 25% s, 75% p
- Ex: Ethane, NH_3, H_2O



→ Hybird orbital

Hyberdization

(This resultant orbitals will have energy equal to the atomic orbitals combined)

There is no sp^4 or sp^5 orbitals because its only px, py, pz.

σ bond → Hyberdized

π bond → unhyberdi