VIDYAPEETH

BATCH CODE: 19-PJ301EA 2025

SUBJECT NAME: CHEMISTRY

CHAPTER NAME:

Chemical bonding and molecular structure

Lecture No. 07

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Today's Goal

Subtopic

- Molecular Orbital Theory
- Molecular Interactions
- Special Bonding
  - 3c-2e Bonds

M.O. → ABMO (Energy higher) | last e⁻ stability ↓

BMO (Energy lower) | last e⁻ stability ↑

homodiatomic molecule

$Z \leq 7$

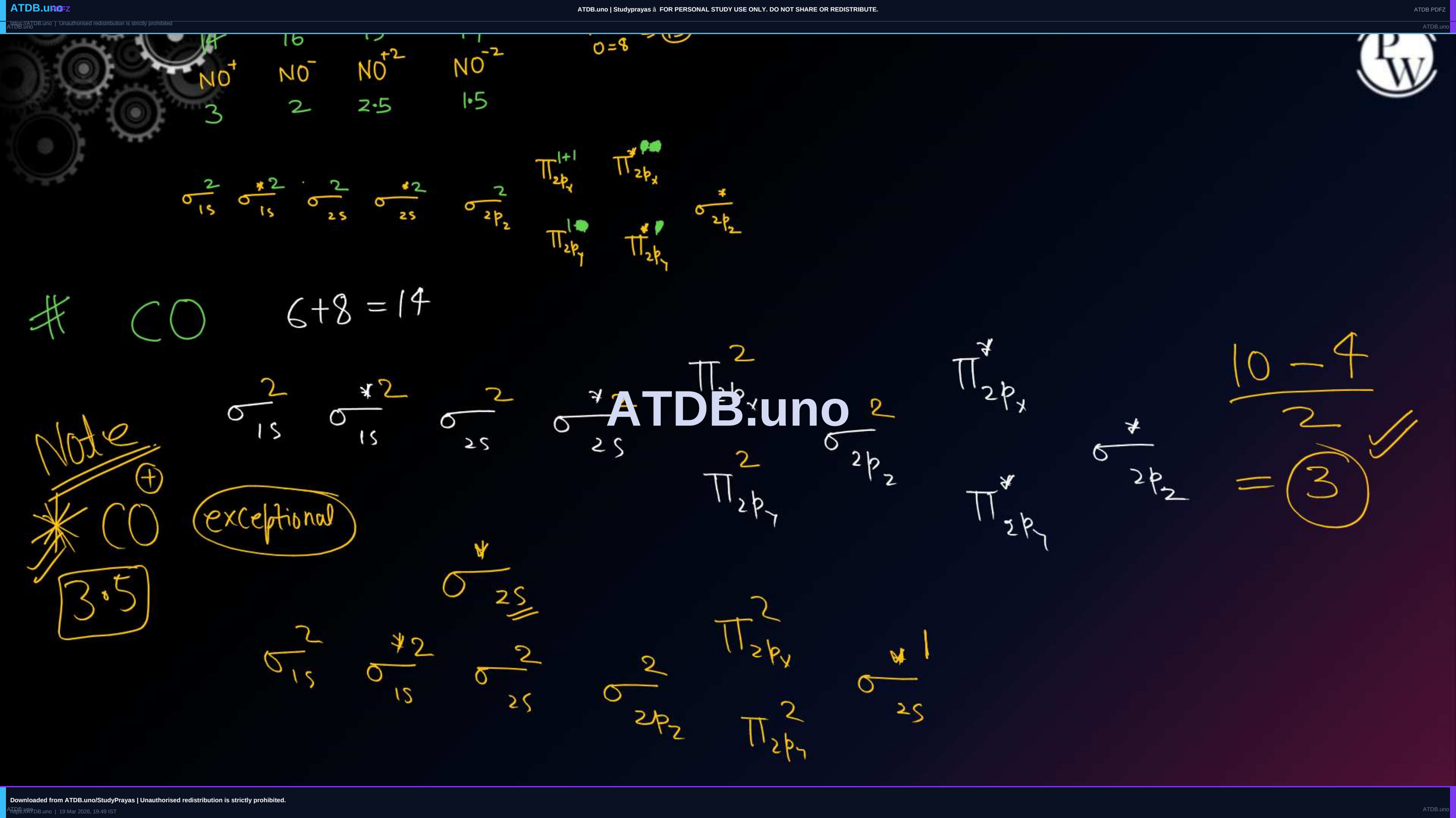
$Z \geq 8$

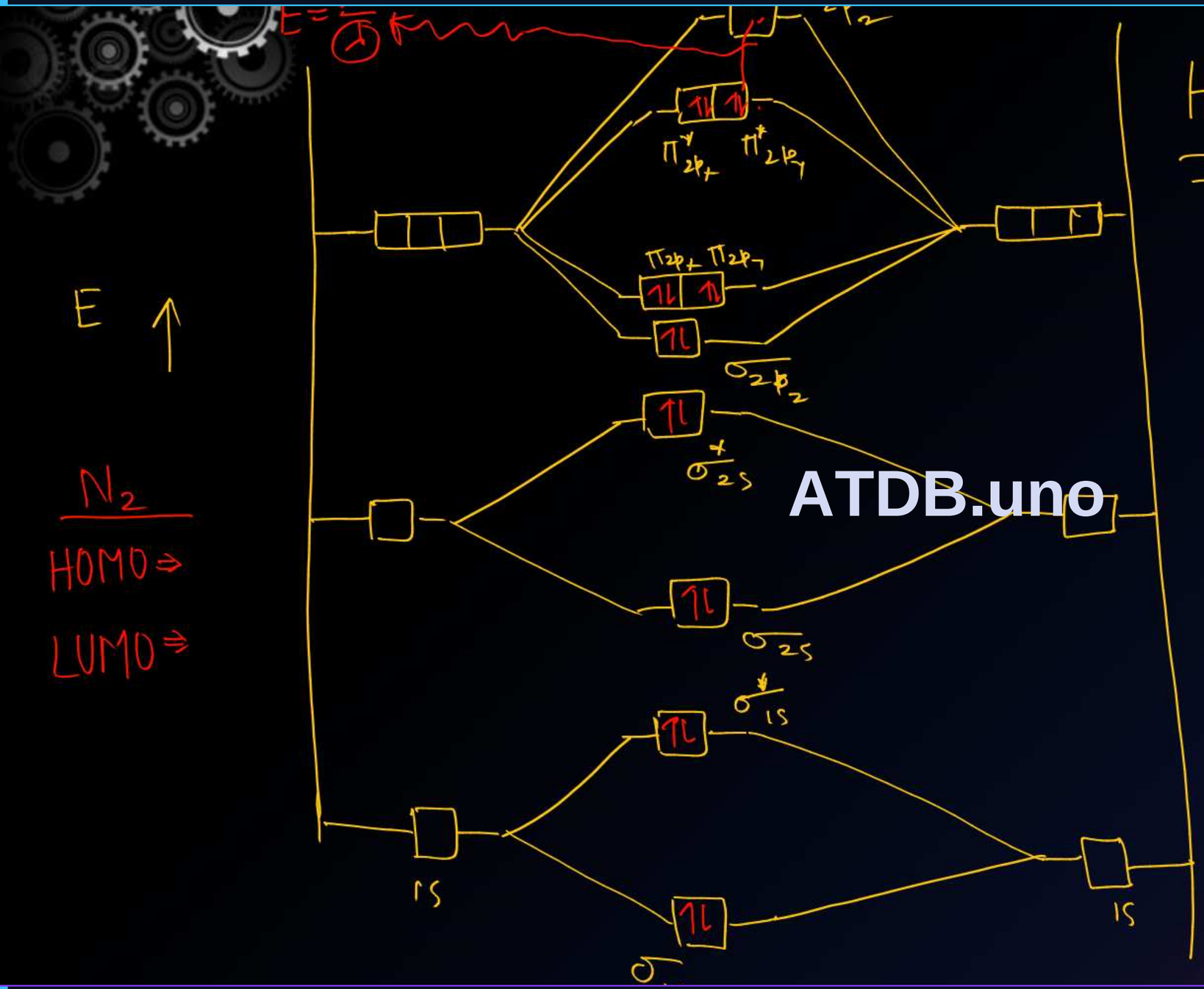
heterodiatomic molecule

as per carbon

$Z \leq 7$

NO ($Z \geq 8$) intermixing almost over





HOMO - LUMO

Highest Occupied molecular Orbital

Lowest Unoccupied molecular Orbital

F_2 = 18

HOMO ⇒ $\pi^*_{2p_x}$ or $\pi^*_{2p_y}$

LUMO ⇒ $\sigma^*_{2p_z}$

Special Bonding :-> H-Bonding

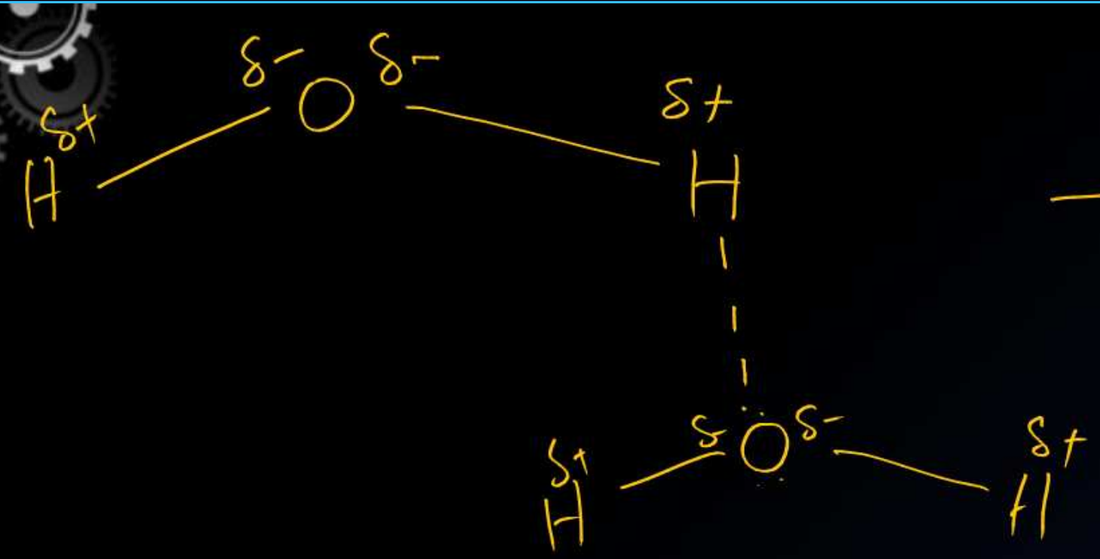
Hydrogen bonding

Hydrogen Bonding

- Intermolecular H-Bonding
- Intramolecular H-Bonding

dipole moment = $q \times l$

formation of a dipole



B.P. ↑

H_2O liq.

- H_2S
- H_2Se
- H_2Te

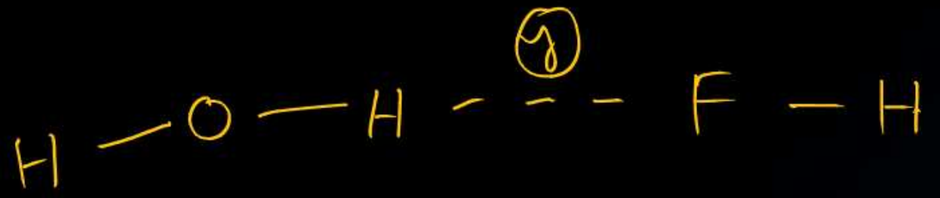
(g)

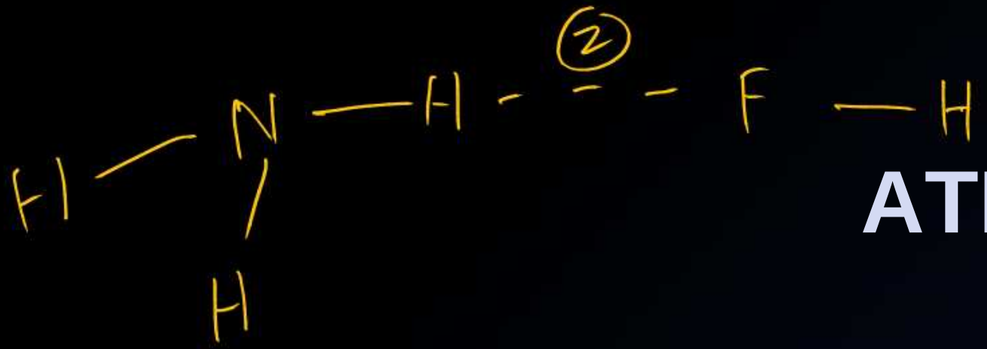
Factors affecting Strength of H-bond

→ (1) Partial +Ve charge on H-atom

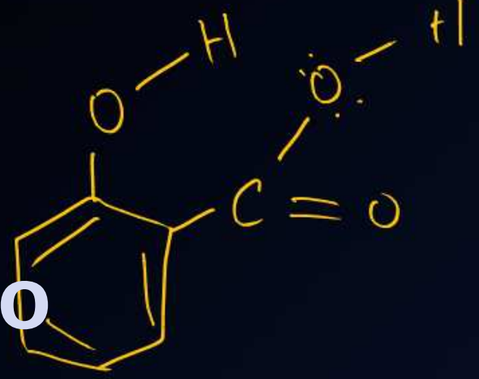
→ (2) Polarisability of EN atom

$x > y > z$





Intramolecular H-bonding



intra

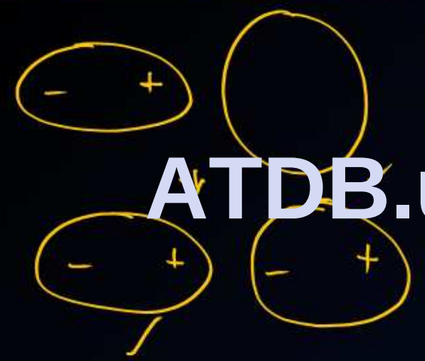
Molecular Interactions

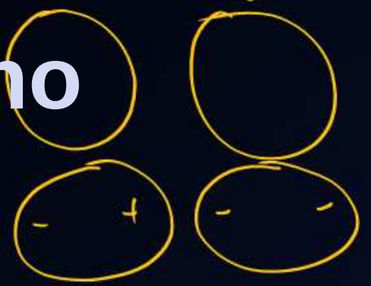
Ion - dipole

dipole - dipole ✓ (H-bonding)

Van-der-Waal interaction
- → dipole - dipole
- → dipole - induced dipole
- → Dispersion force { London forces }

① Permanent dipole

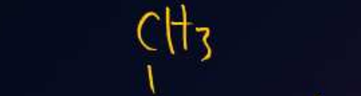
② 

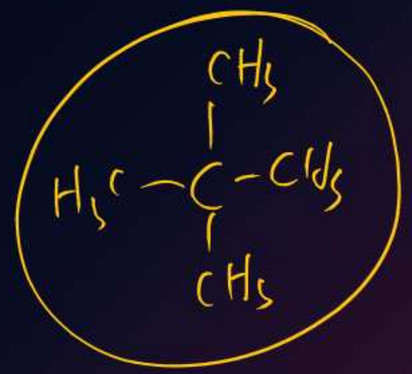


Factors →

①

$CH_3-CH_2-CH_2-CH_3$





Energy - distance Relationship

1. Ionic Bond — $\frac{1}{r}$
2. Ion - dipole — $\frac{1}{r^2}$
3. dipole - dipole — $\frac{1}{r^3}$
4. ion - induced dipole — $\frac{1}{r^4}$
5. dipole - induced dipole — $\frac{1}{r^6}$
6. London dispersion — $\frac{1}{r^6}$

Special Bonding :⇒

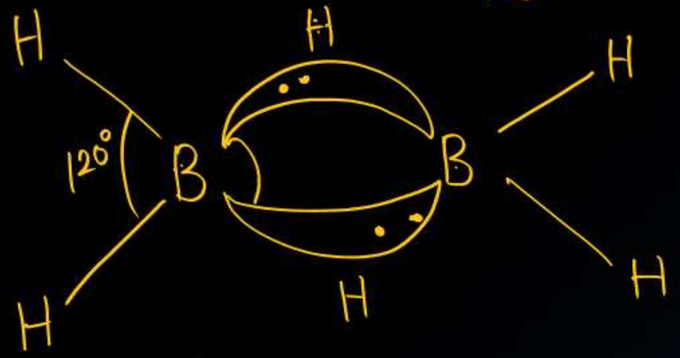
BH_3

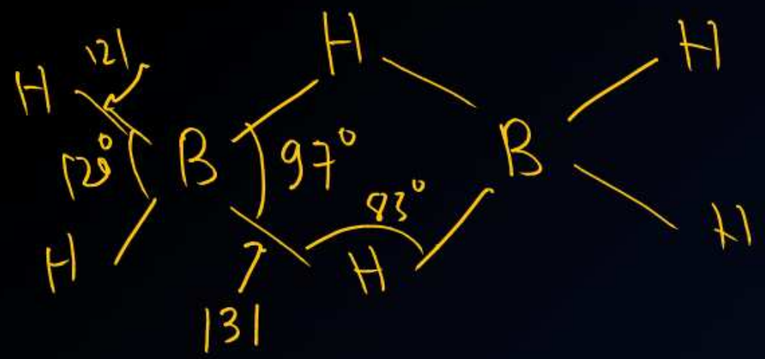
$B = 1s^2, 2s^2, 2p^1$

$= 1s^2, 2s^1, 2p^1_x, 2p^1_y$

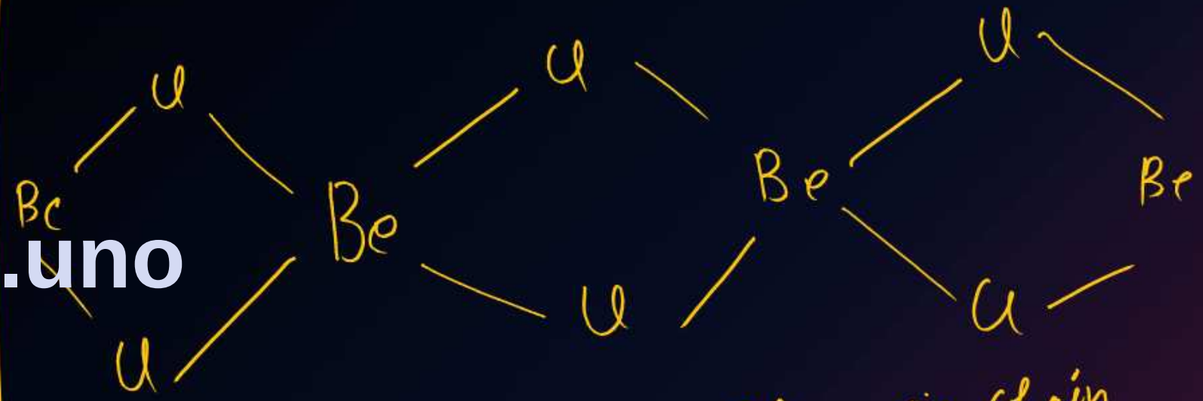
B_2H_6

3C-2e Bond





$BeCl_2$ → Be_2Cl_4



Polymeric Chain ⇒

3C-4e bond

O_2

HOMO = σ_{2p_z}

LUMO = $\pi^*_{2p_x}$ or $\pi^*_{2p_y}$

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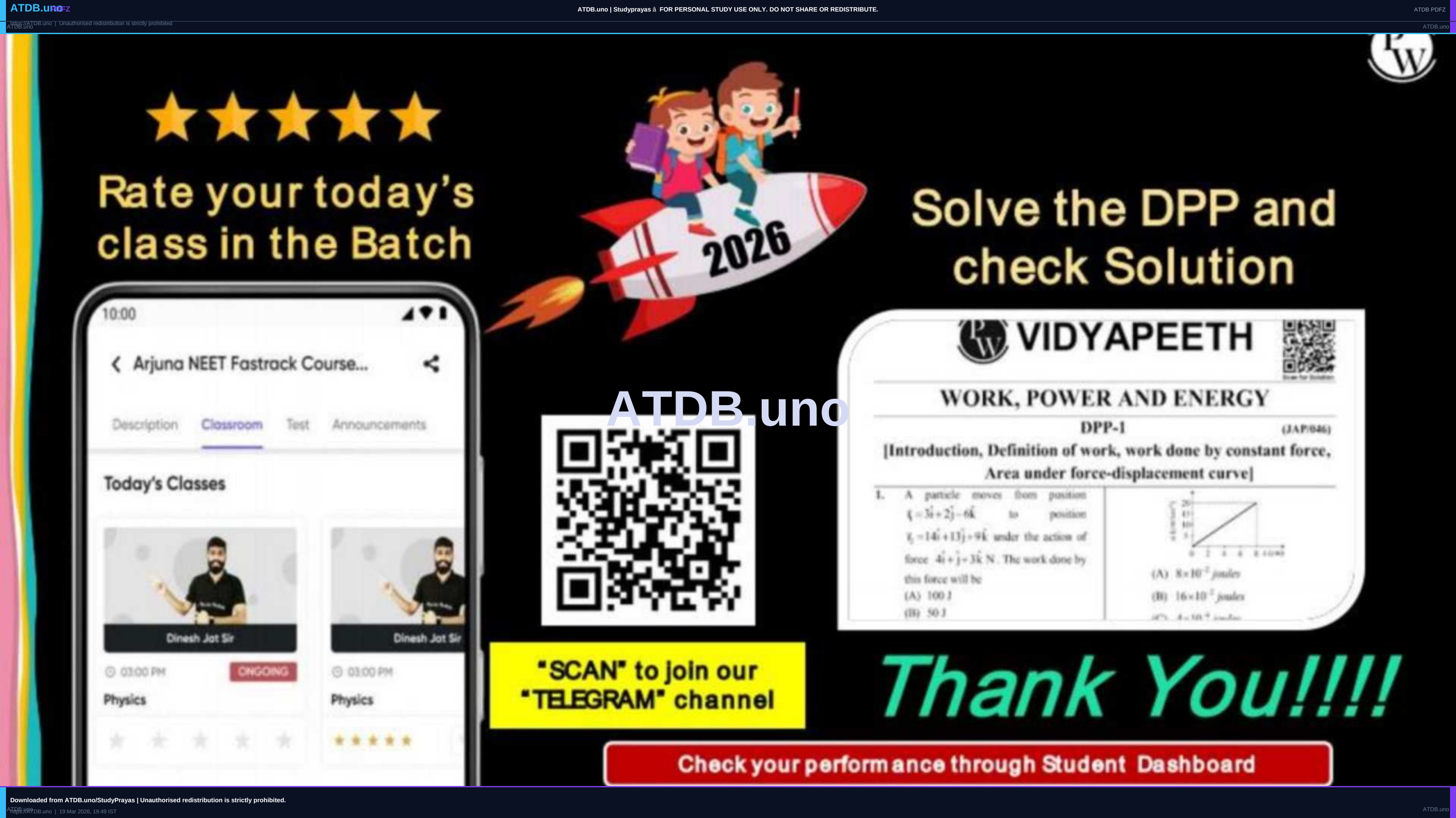

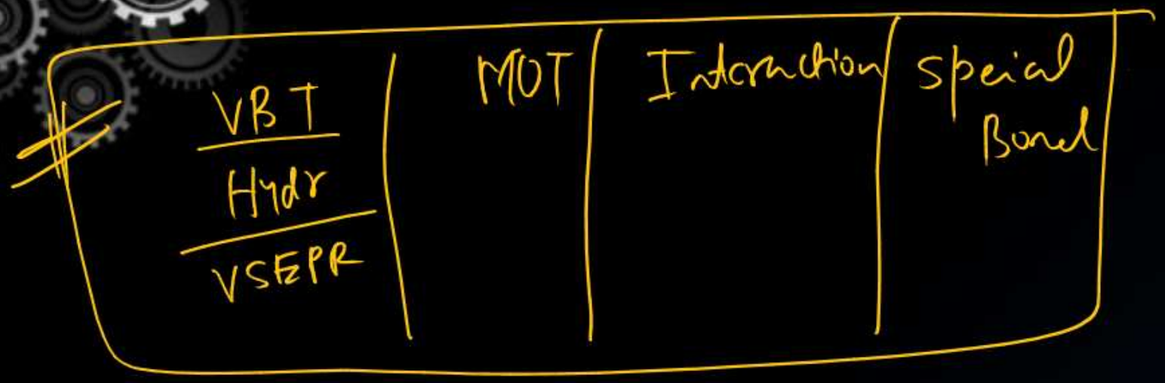

C_3O_2

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