VIDYAPEETH

BATCH CODE: 19-PJ301EA 2025

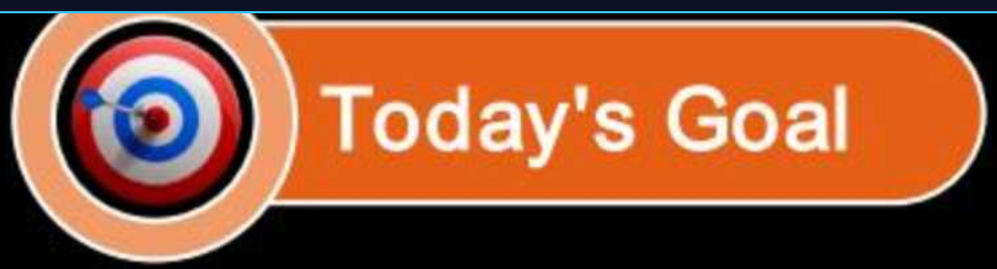
SUBJECT NAME: CHEMISTRY

CHAPTER NAME:

Chemical bonding and molecular structure

Lecture No. 06

By – Swapnil Sir



Subtopic

Molecular Orbital Theory (MOT)

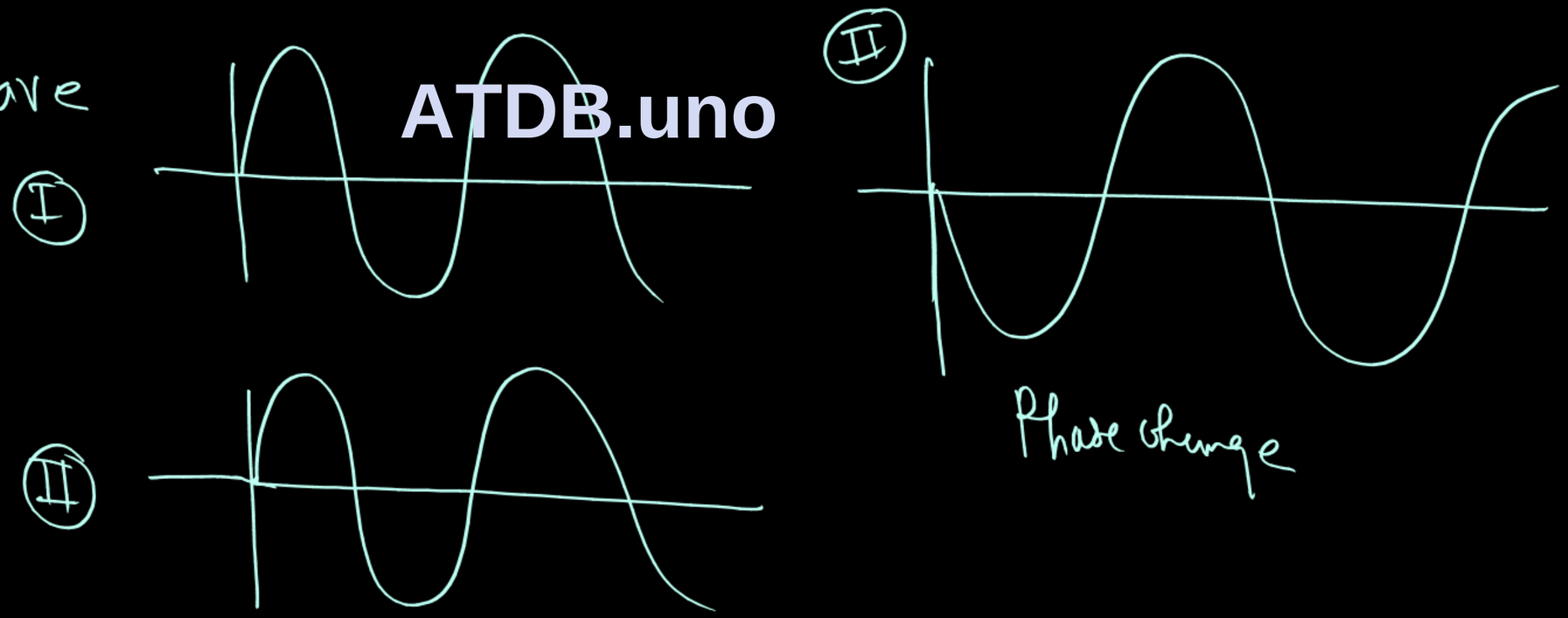
ATDB.uno

Molecular Orbital Theory →

Atomic orbitals (wavefunction) → Molecular Orbitals

(Same energy or nearly same energy)

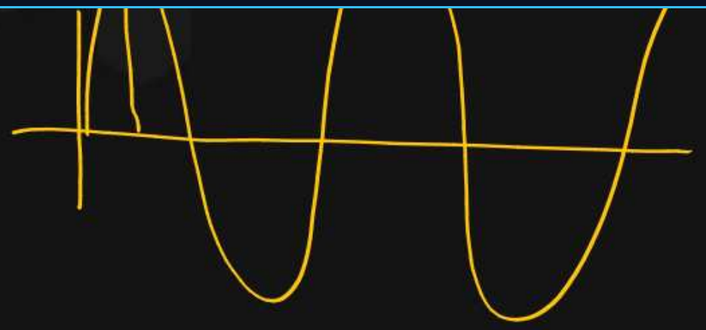
Superposition of wave



Superposition

Atomic orbital

→ in same phase M.O.



amplitudes adds

B.M.O.

→ in opposite phase M.O.

A.B.M.O. amplitude subtract.

ψ_1

ψ_2

$\psi_1 + \psi_2 = (a_1 + a_2)$

$\psi_1 - \psi_2 = (a_1 - a_2)$

$\psi_1^2 + \psi_2^2 < (\psi_1 + \psi_2)^2$

Atomic orbital of same energy or nearly same energy

LCAO

- (onstructive (in same phase) ⇒ Bonding Molecular orbital
- Destructive ⇒ Anti Bonding MO (in opposite phase)

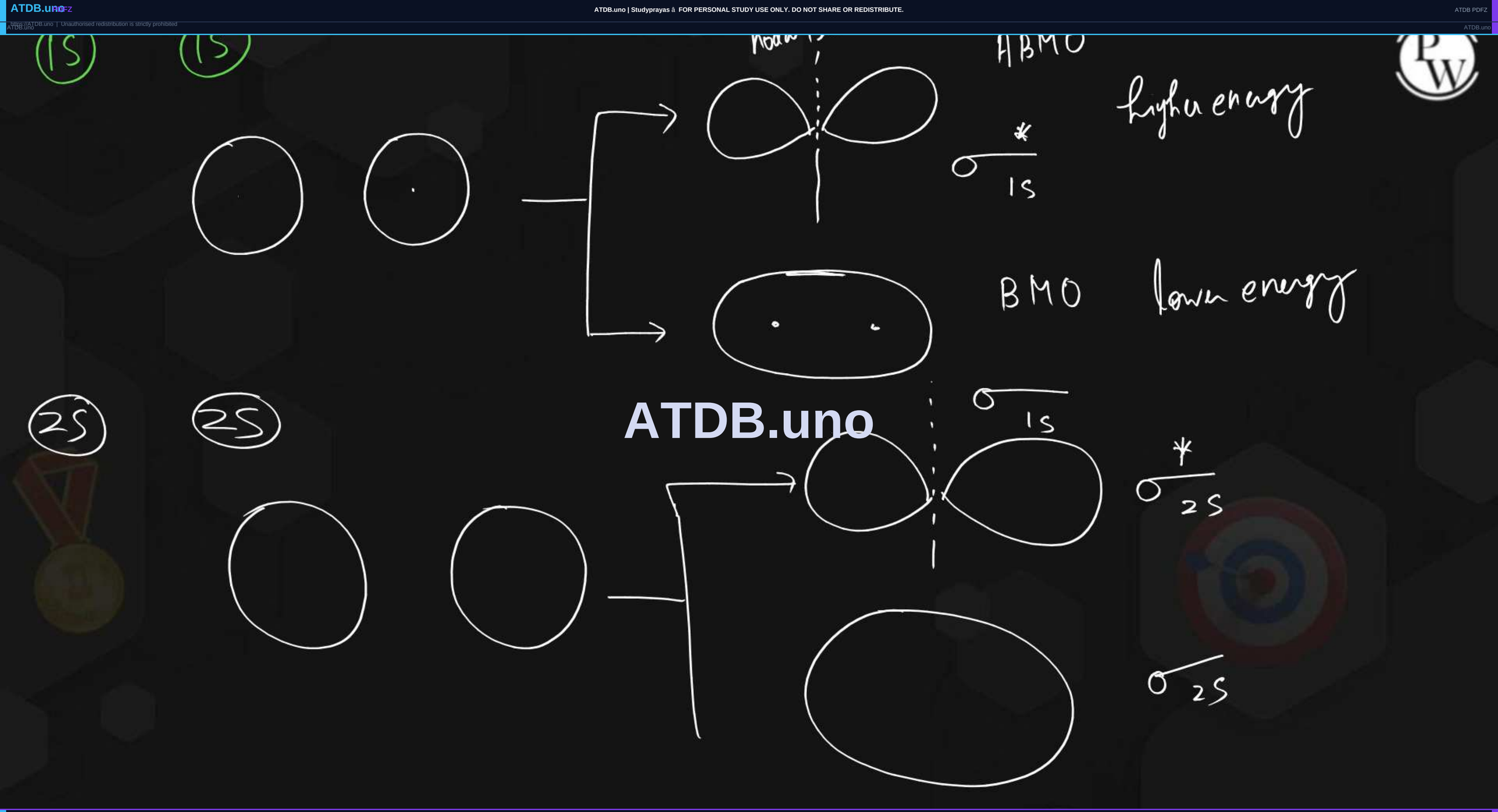
1S 2S X

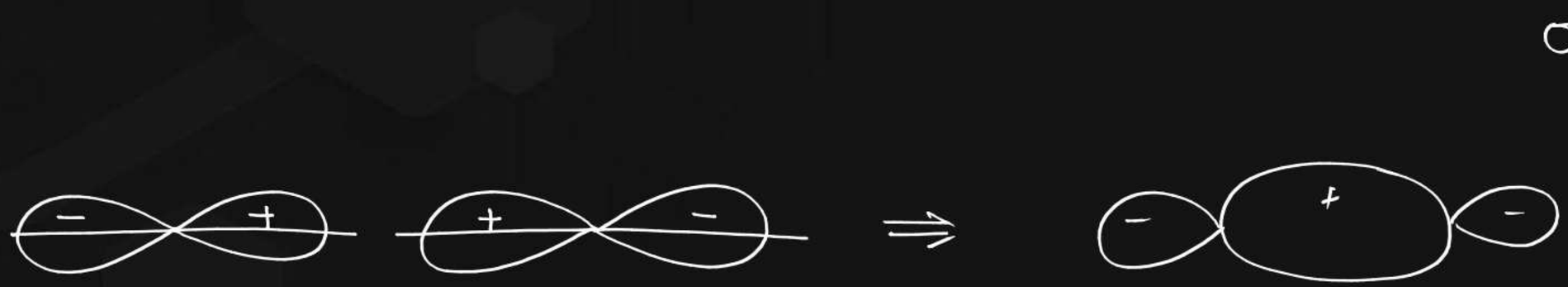
1S 1S ✓

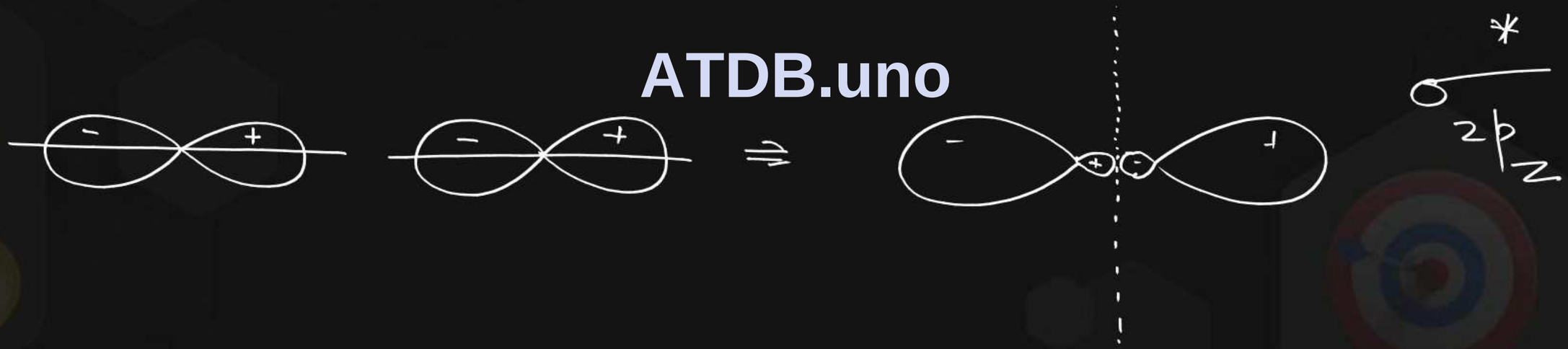
2S 2S ✓

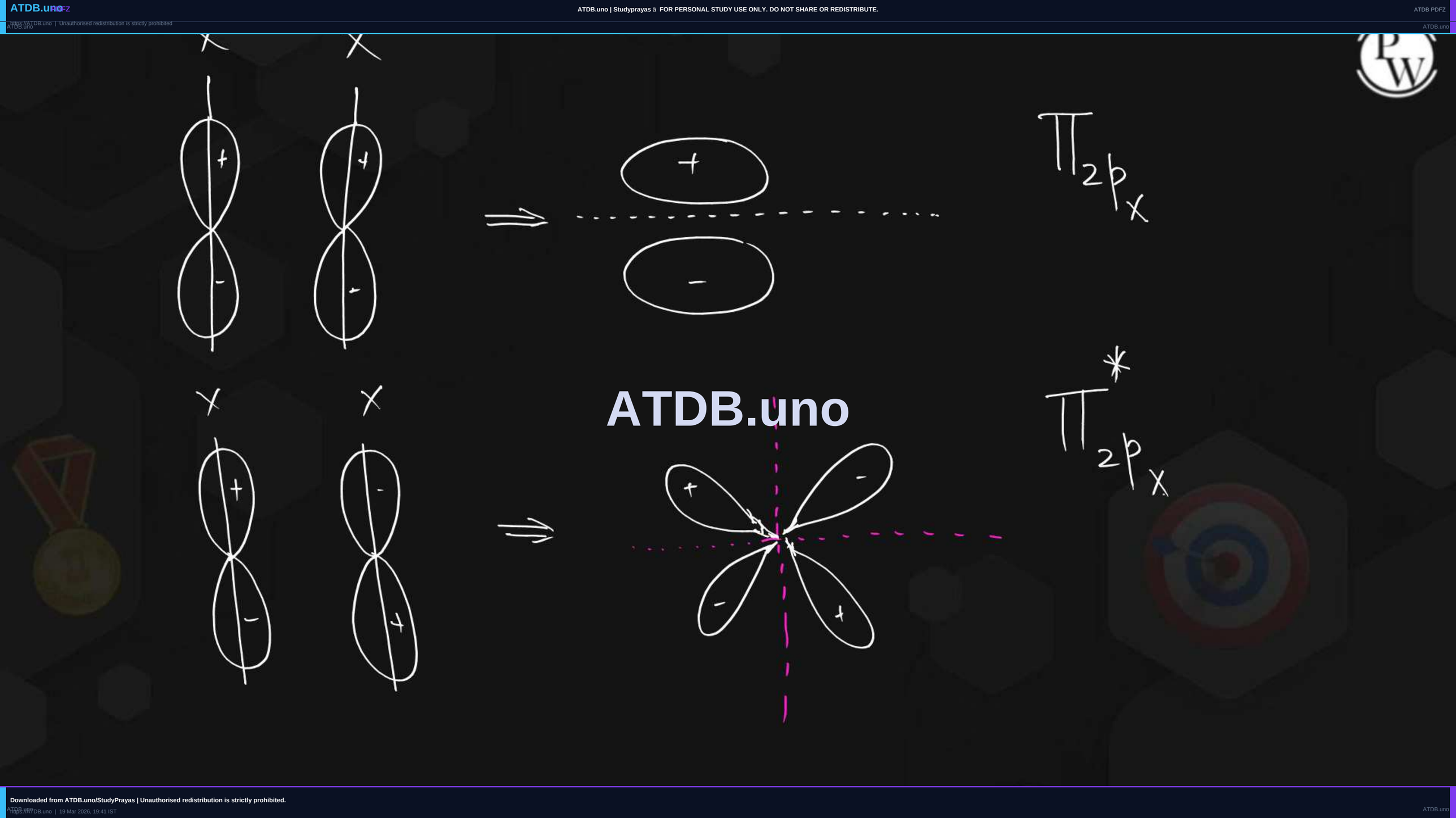
2S, 2P ✓

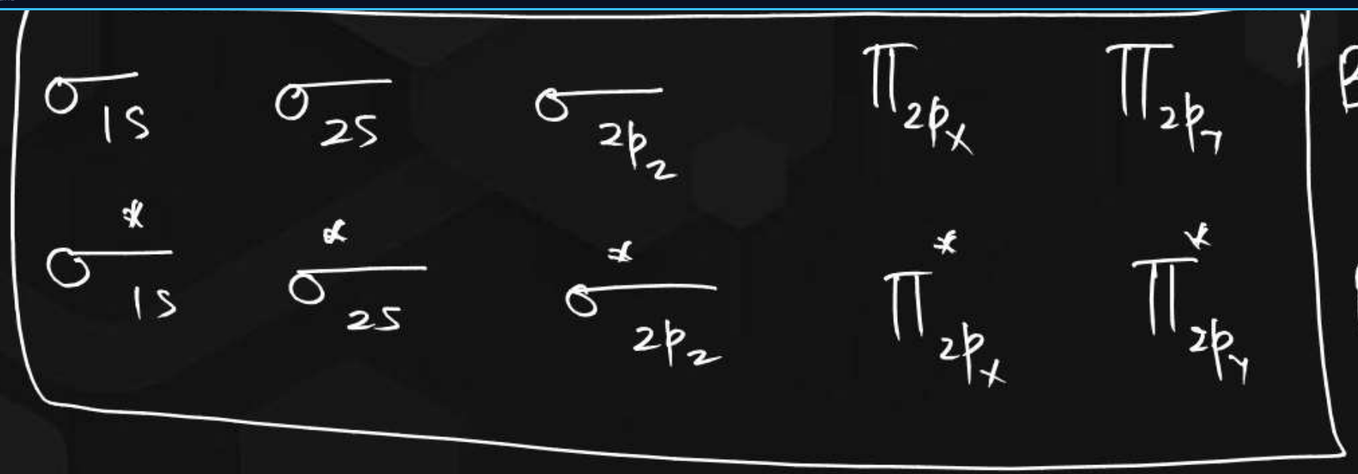
2S 2P



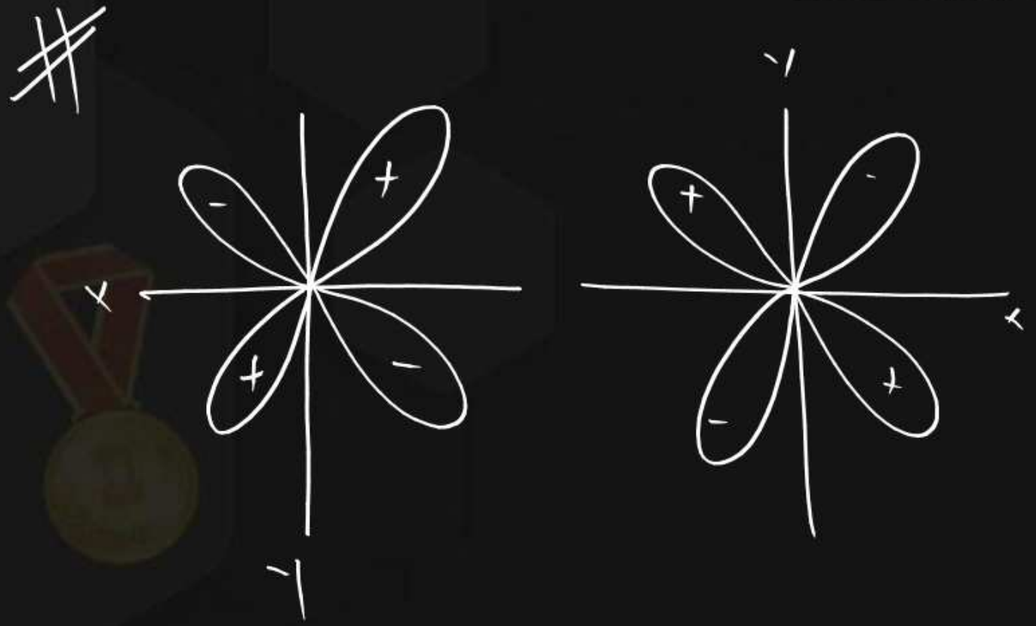




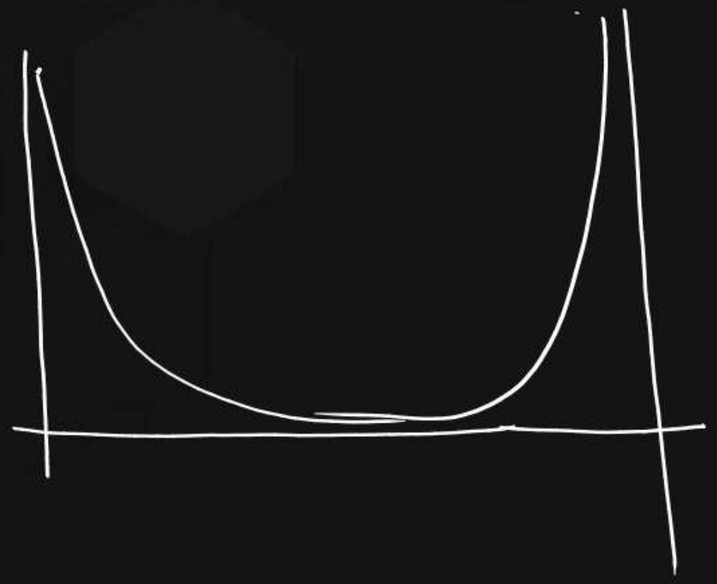


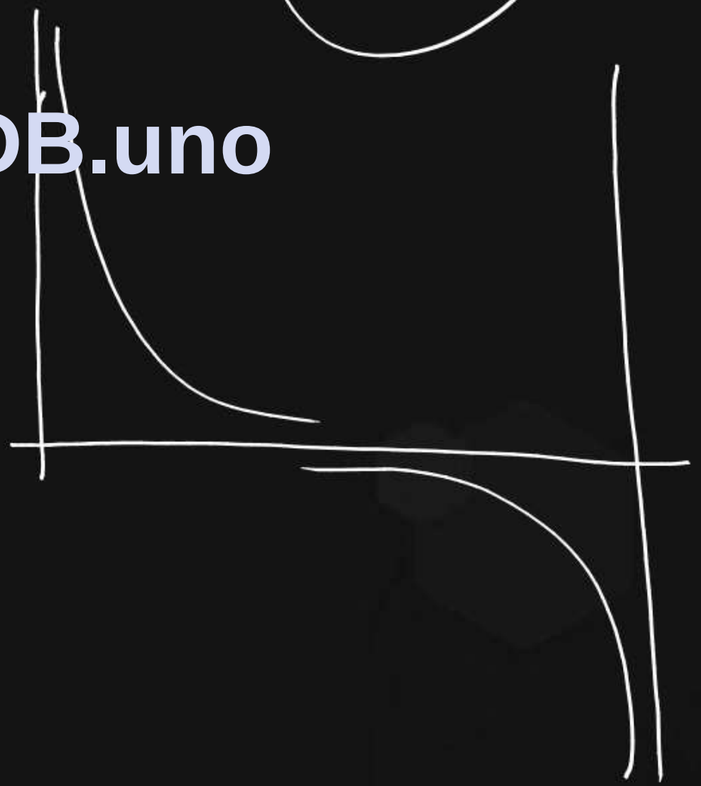


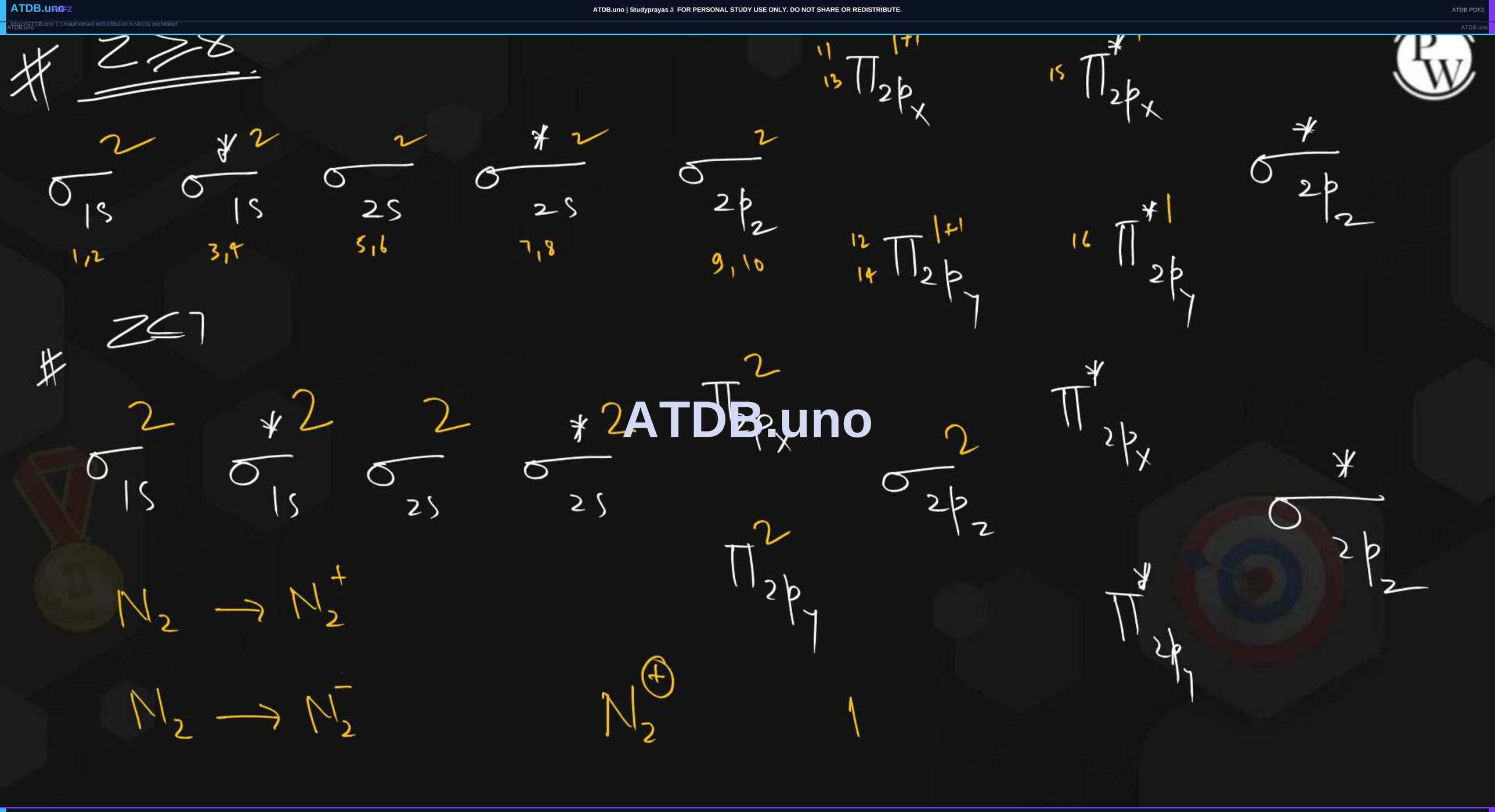
ABMO > BMO



25 2p







(1) Bond Order :⇒

$$B.O. = \frac{N_b - N_a}{2}$$

N_b = no. of $\bar{e}$ in BMO

N_a = no. of $\bar{e}$ in ABMO

$B.O. \propto$ Bond Strength

$\propto$ Stability

$\propto \frac{1}{\text{Bond length}}$

B.O.	Inference
-ve	Species does not exist
0	
+1/2	exist but highly unstable
+1	Stable Single bond
+2	Stable double bond
+3	Stable triple bond

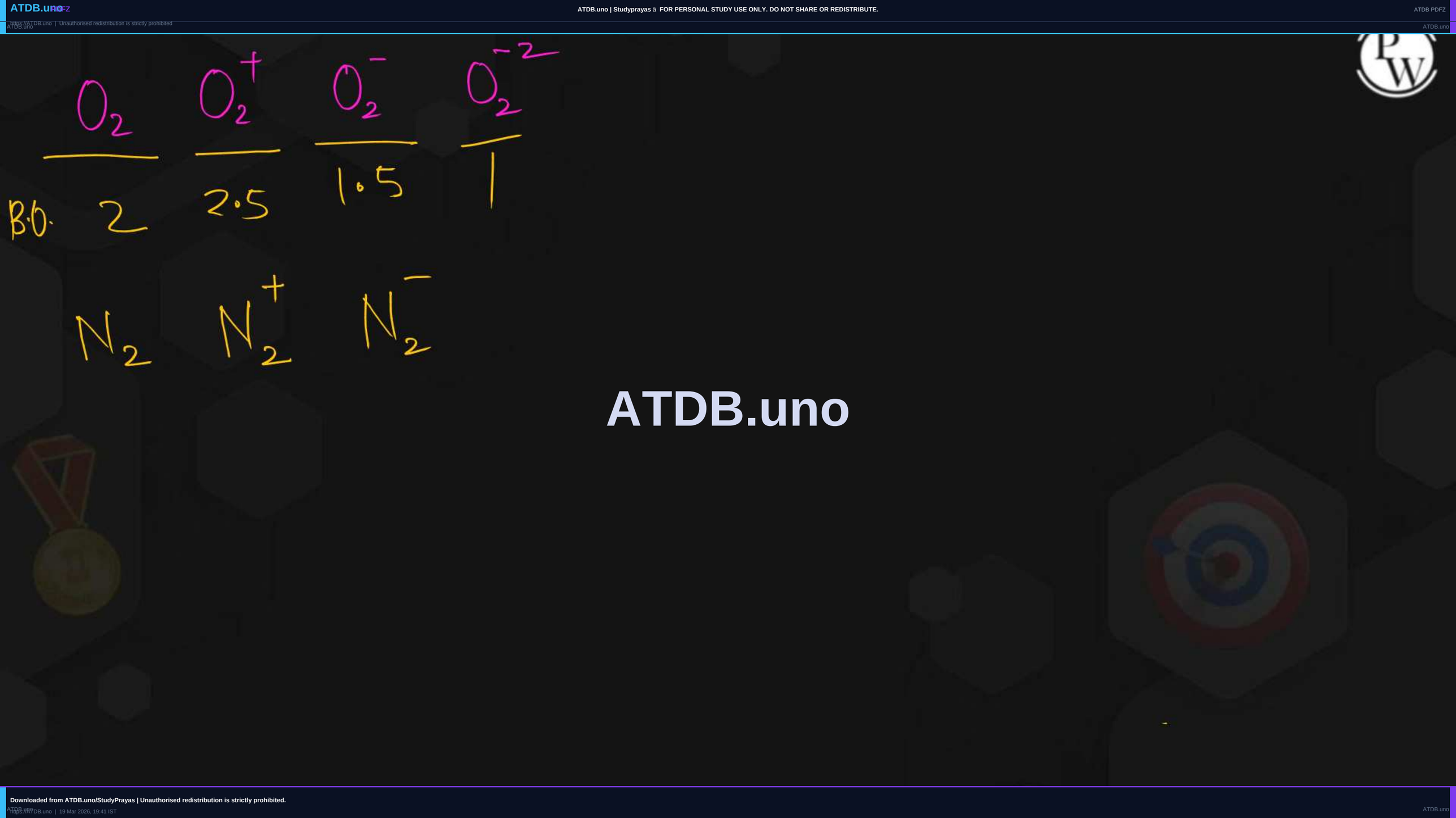
Magnetic Behaviour ⇒

Paramagnetic ⇒ due to presence of unpaired $\bar{e}$'s

magnetic moment = $\sqrt{n(n+2)}$ B.M.

n = no. of unpaired e's

Diamagnetic → Absence of unpaired $\bar{e}$'s



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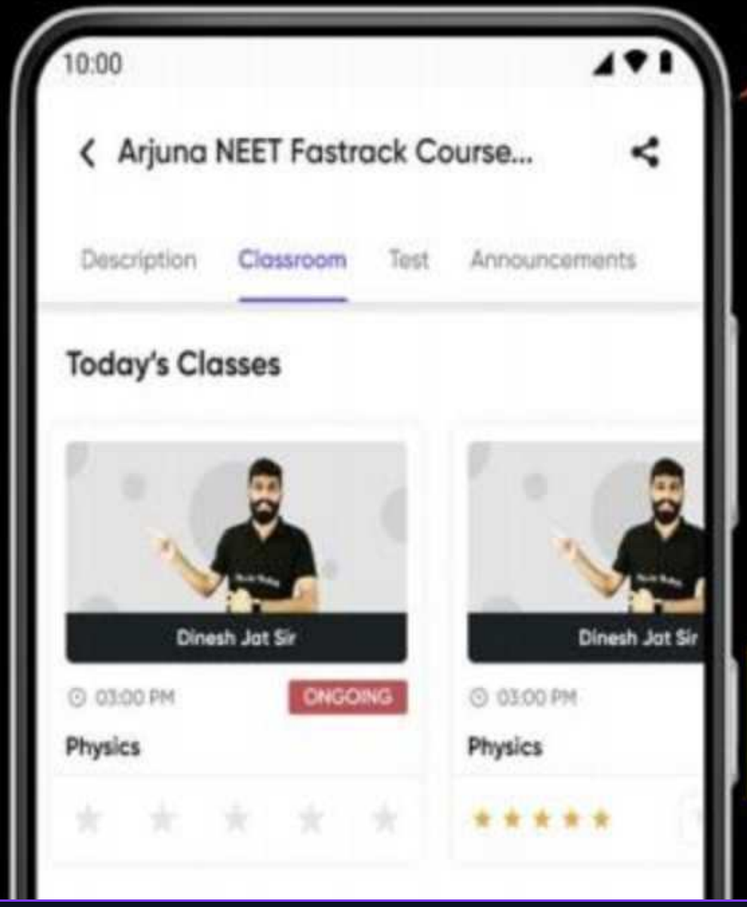
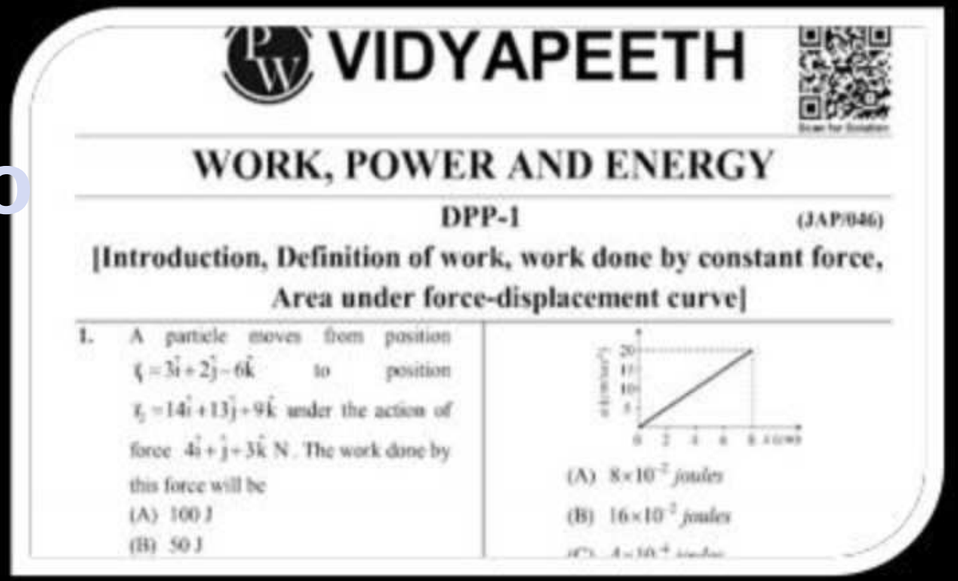
Solve the DPP and check Solution





VIDYAPEETH

WORK, POWER AND ENERGY

DPP-1 (JAP/046)

[Introduction, Definition of work, work done by constant force, Area under force-displacement curve]

1. A particle moves from position $\vec{r}_1 = 3\hat{i} + 2\hat{j} - 6\hat{k}$ to position $\vec{r}_2 = 14\hat{i} + 13\hat{j} + 9\hat{k}$ under the action of force $4\hat{i} + \hat{j} + 3\hat{k}$ N. The work done by this force will be

(A) 100 J

(B) 50 J

(A) 8×10^{-2} joules

(B) 16×10^{-2} joules

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