

PRAKAS

JEE 2026

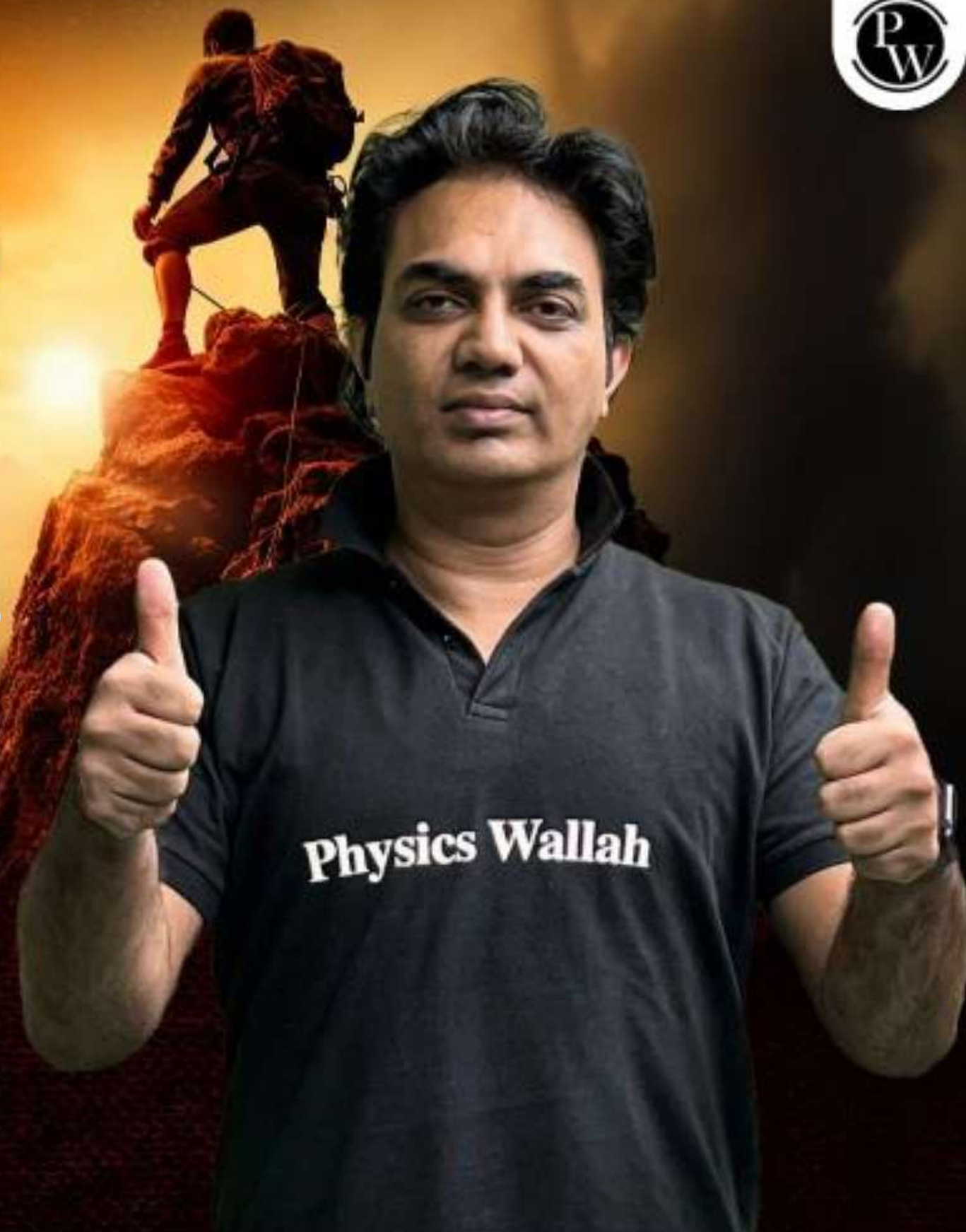
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PHYSICAL CHEMISTRY

SOLUTIONS

Lecture – 07

FAISAL RAZAQ





Topics to be covered

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A Azeotropes



viii) Acetone + CS₂

S = C = S (non polar)



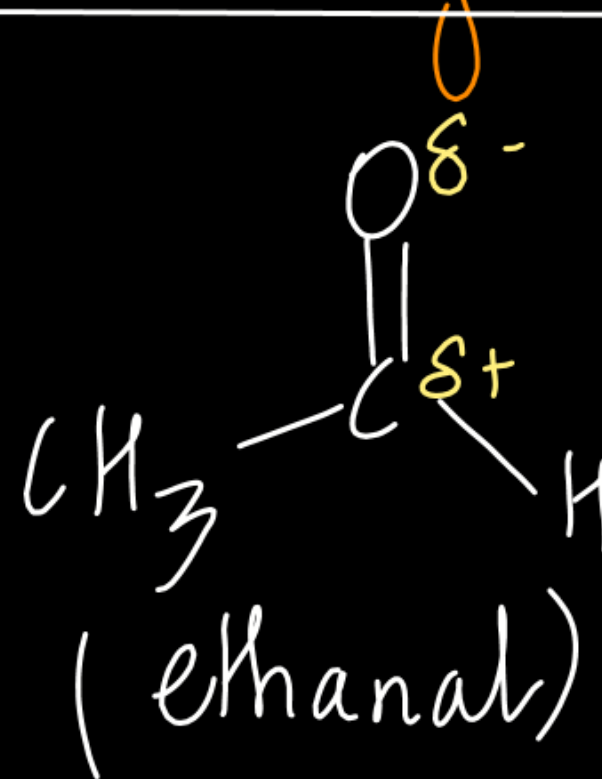
acetone - D.P - DP

CS₂ - V.W.

(+) ve deviated.

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ix) Acetaldehyde and CS₂



— DP — DP

(+)ve deviated.

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CS₂ — V.W.



Question

5

At a given temperature, total vapour pressure in torr of a mixture of volatile components A and B is given by $P_T = 120 - 75X_B$, hence P_A^0 and P_B^0 are -

A) 120, 75

B) 120, 195

C) 120, 45

D) 75, 45

$$P_T = P_A^0 X_A + P_B^0 X_B$$

$$= P_A^0 (1 - X_B) + P_B^0 X_B$$

$$= P_A^0 - X_B (P_A^0 - P_B^0)$$

$$P_A^0 = 120 ;$$

$$P_B^0 = 45 ;$$

$$P_A^0 - P_B^0 = 75$$

$$P_B^0 = P_A^0 - 75$$

$$= 120 - 75$$

$$= 45$$



Ans : ~~(B)~~ (C)



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Negative Deviation



$A-B$ interaction $>$ $A-A$ and $B-B$ interactions

"when weaker interactions are replaced by stronger interaction."

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Hydrogen bonding $>$ $DP-Dp$ $>$ $V.W$

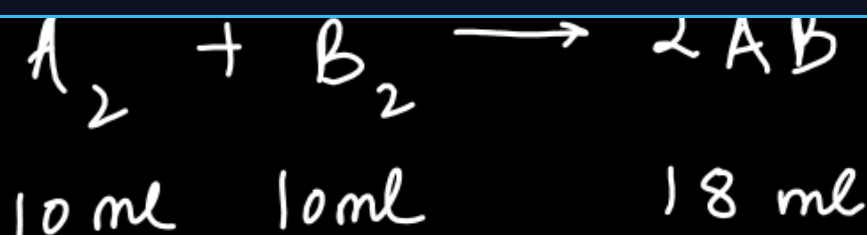
CONDITIONS

$$1) \Delta H_{mix} < 0$$

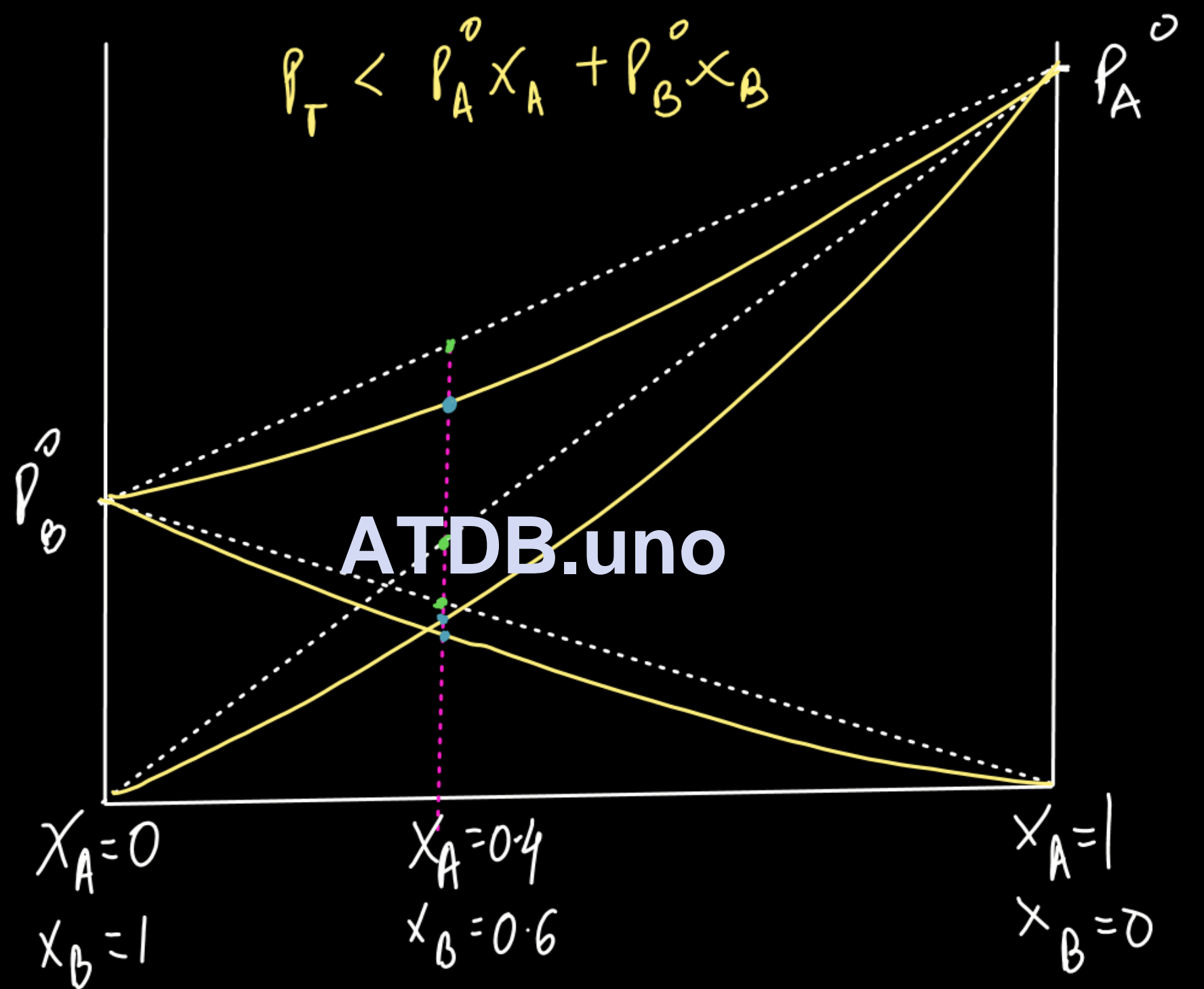
$$2) \Delta V_{mix} < 0$$

$$3) \Delta S_{mix} > 0$$

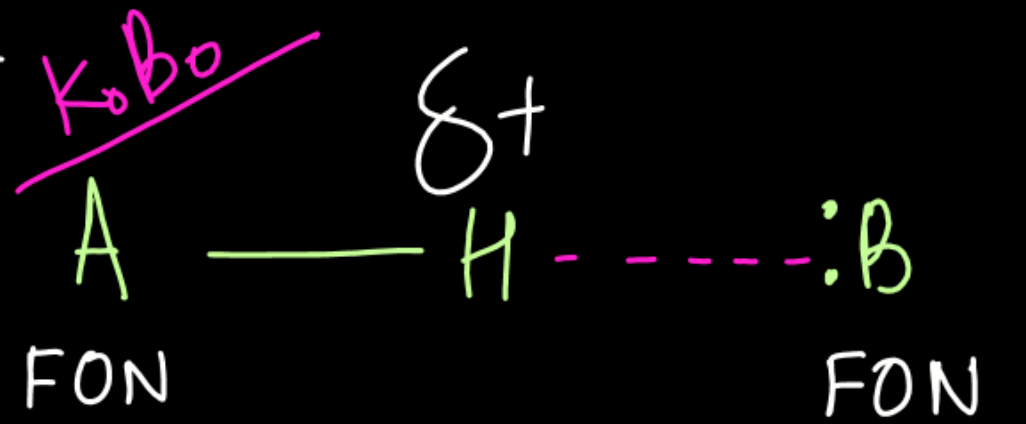
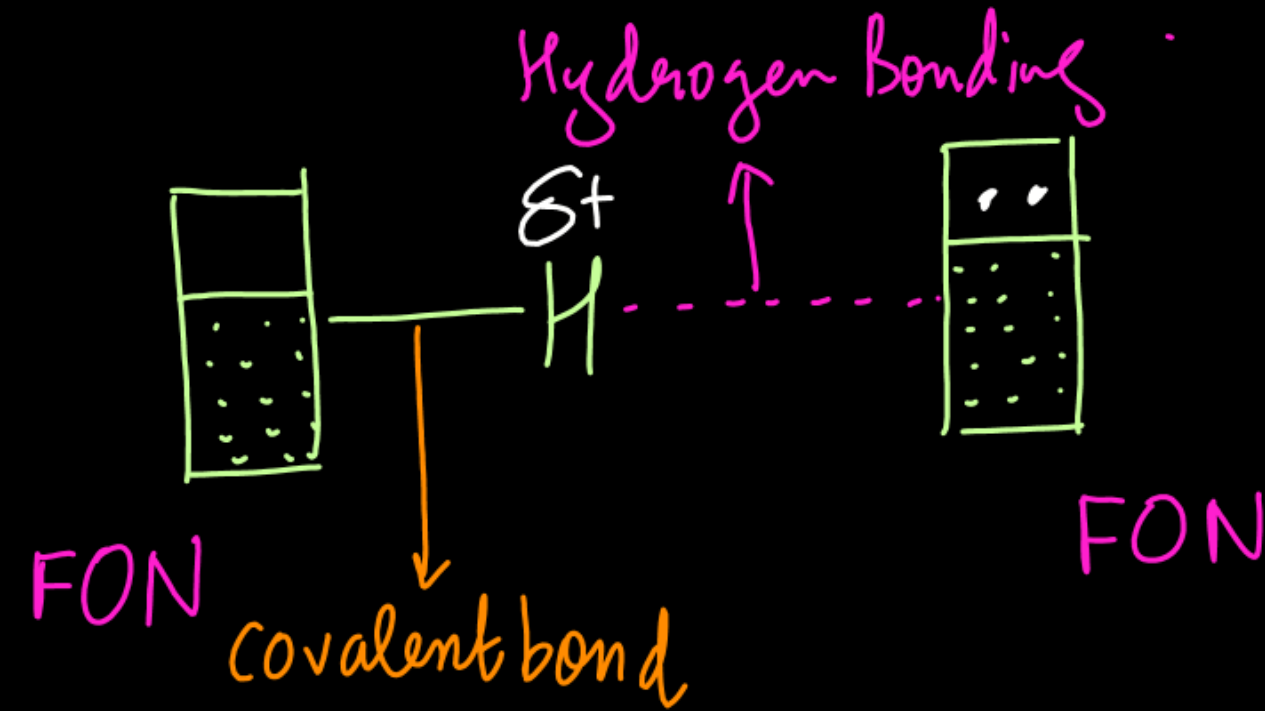
$$4) \Delta G_{mix} < 0$$



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Criteria for Hydrogen Bonding

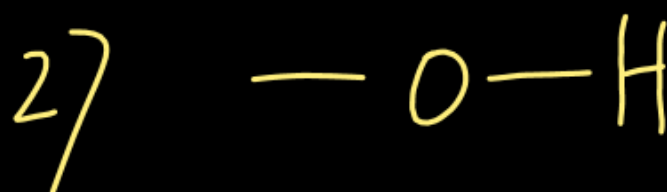


Hydrogen bond is stronger

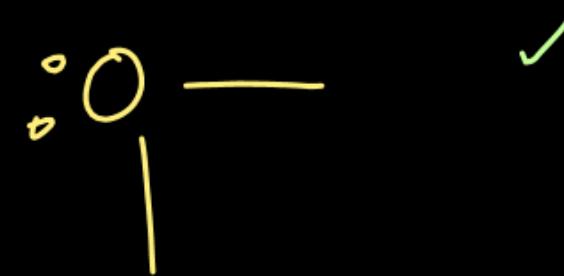
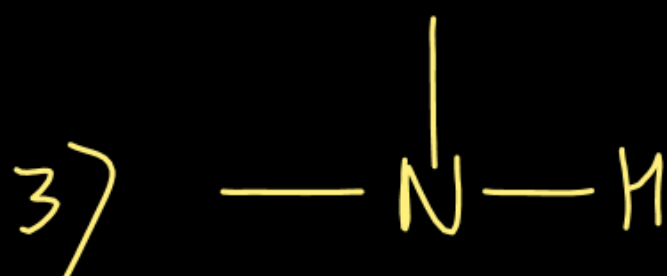
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$(E.N)_A > (E.N)_B$

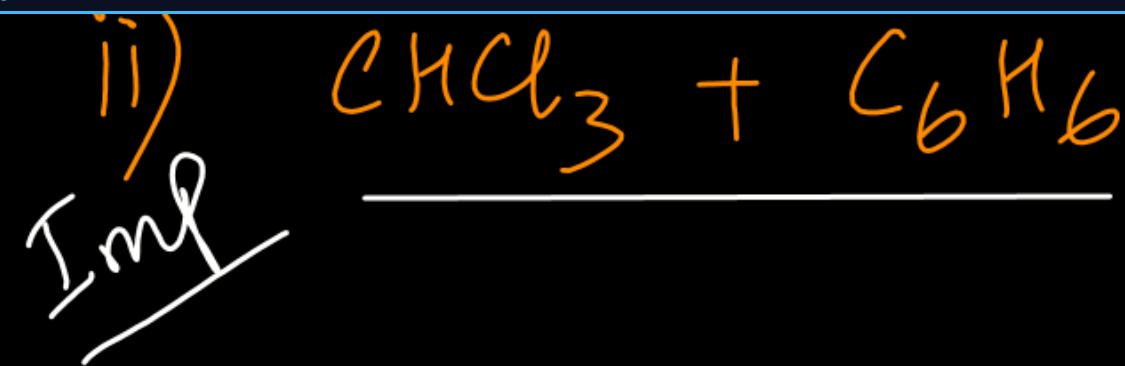
Compare the extent of H-bonding



$2 > 1 > 4 > 3$

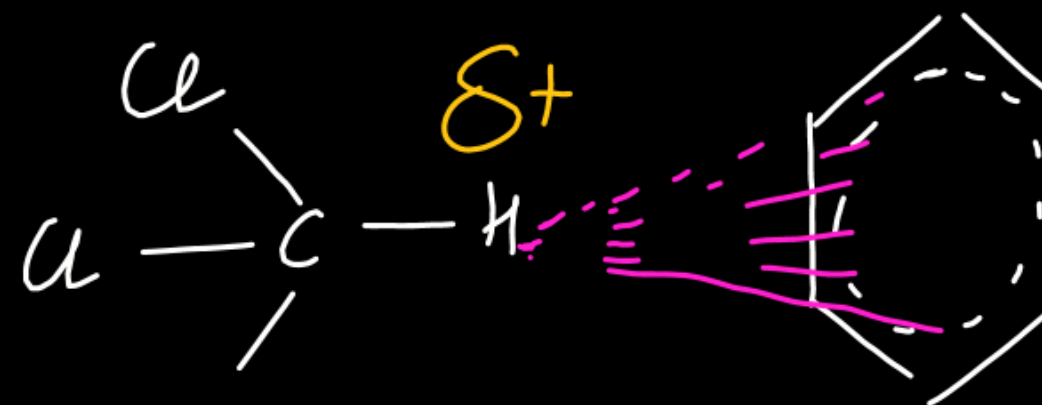


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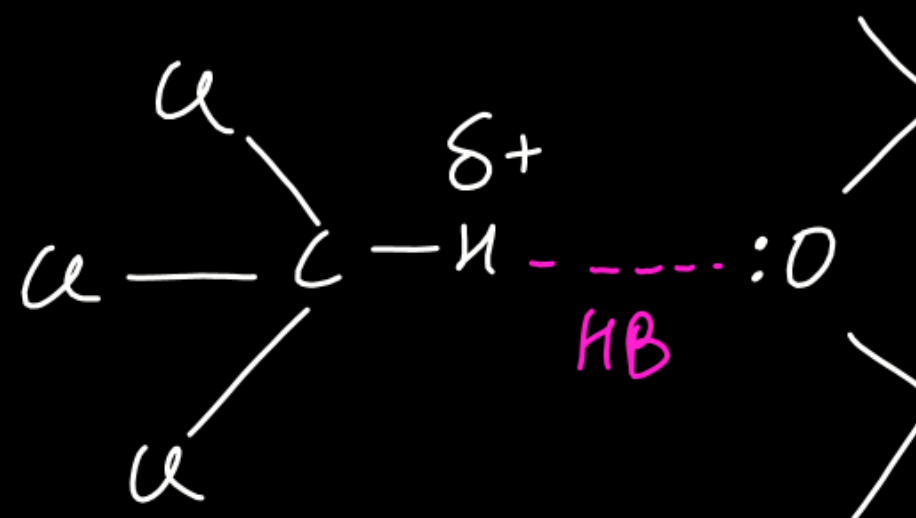
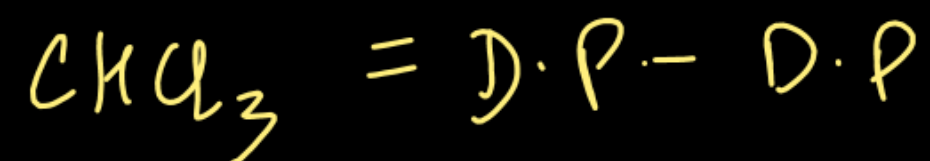
Chloroform (DP-DP)
 (Polar)

C₆H₆ (V.W)
 (non-polar)

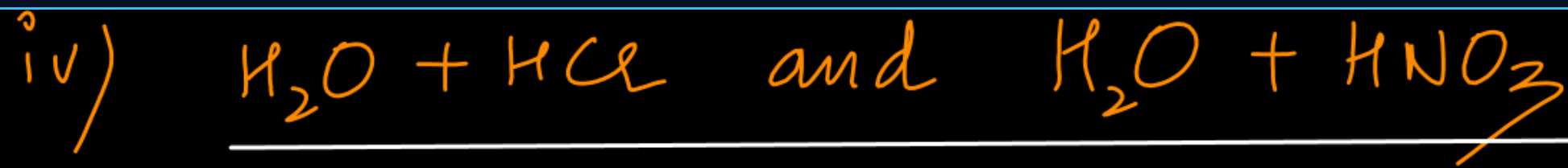


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Due to interaction between hydrogen and π -electrons of benzene, the solution shows (-)ve deviation.



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In water $HCl \longrightarrow H^+ + Cl^-$

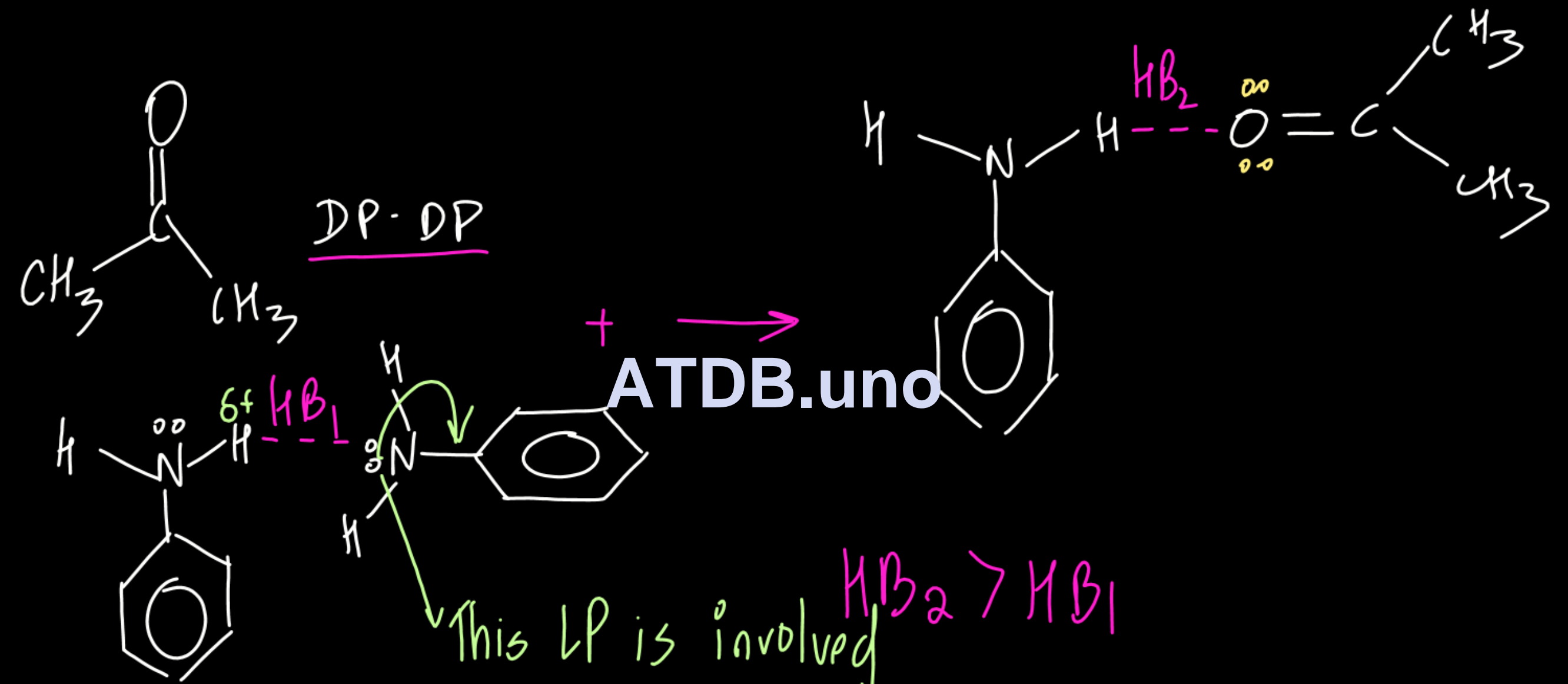
and ions do not evaporate.
leading to negative deviation.



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vi) CH₃COCH₃ + aniline



This LP is involved in resonance, so less available for interaction with H.

$\text{HB}_2 > \text{HB}_1$

Question

A solution of two miscible liquids showing negative deviation from Raoult's law will have

{ JEE Main - 2024 }

~~A) increased V.P, increased B.P~~

~~B) increased V.P, decreased B.P~~

c) decreased V.P, decreased B.P

D) decreased V.P, increased B.P

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Ans: (D)

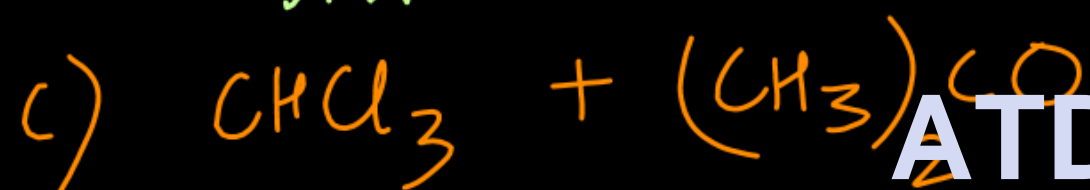
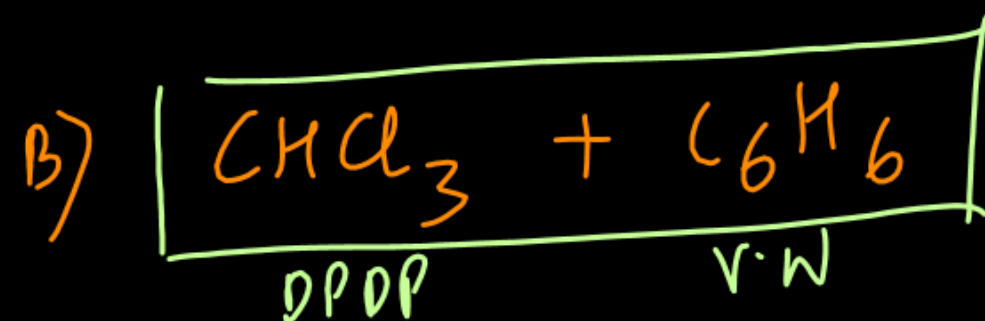
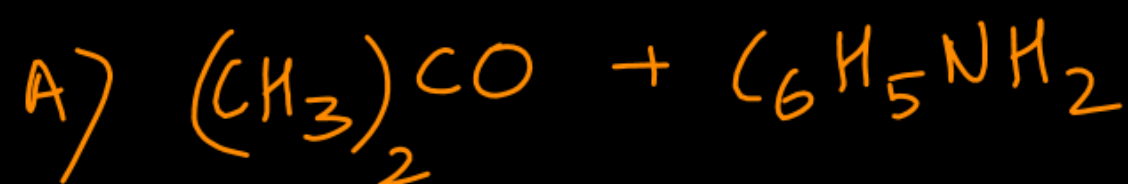


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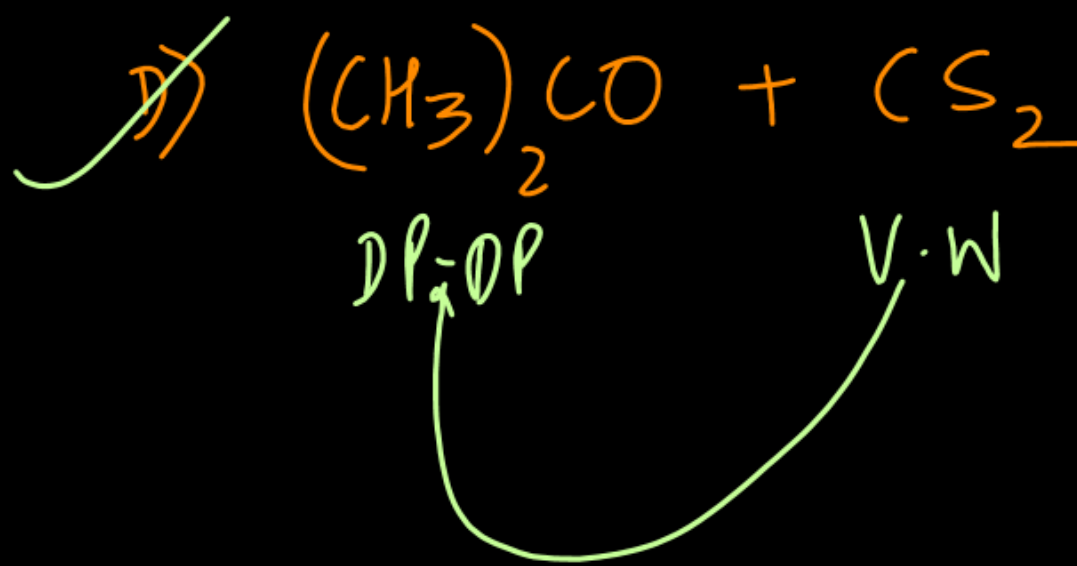
Question Identify the mixture that shows (+)ve deviation -



[JEE Main]



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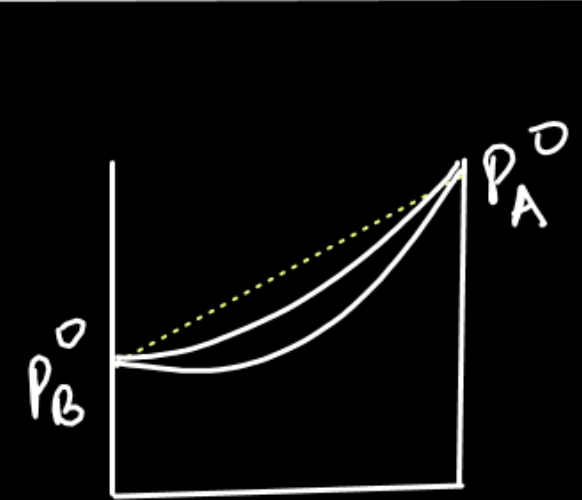


Ans: (D)

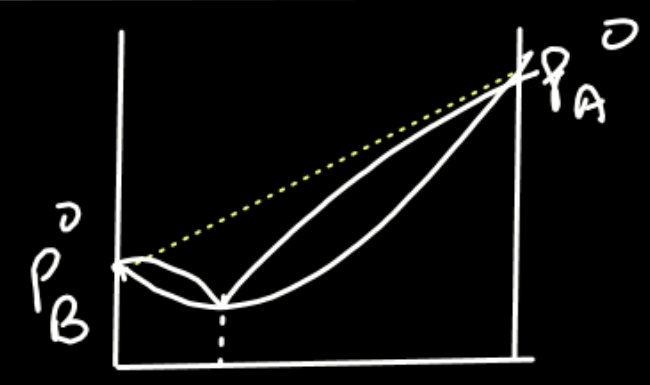


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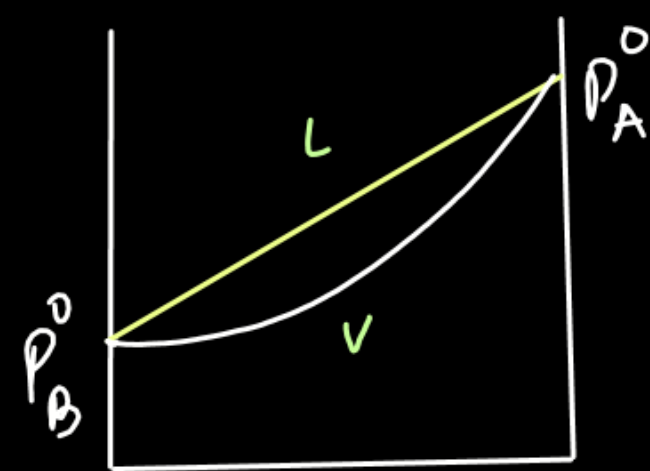
Pressure-Composition Curve for Non-Ideal Solutions



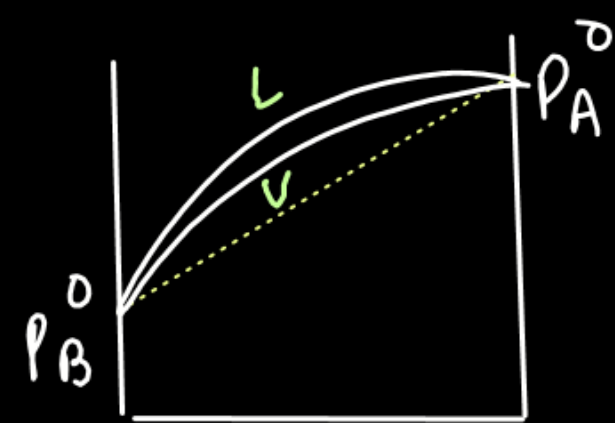
weak (-)ve



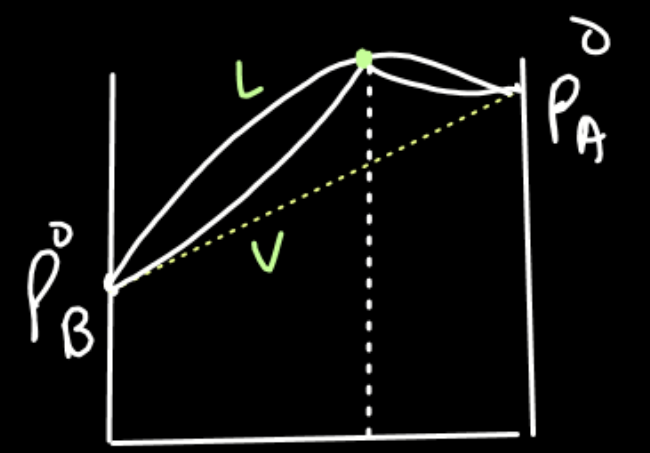
Strong (-)ve



(Ideal)



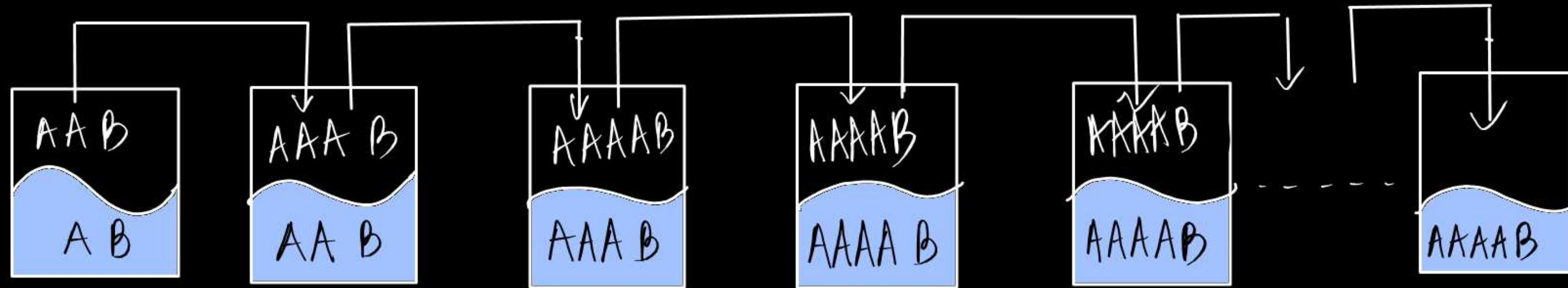
weak (+)ve



Strong (+)ve

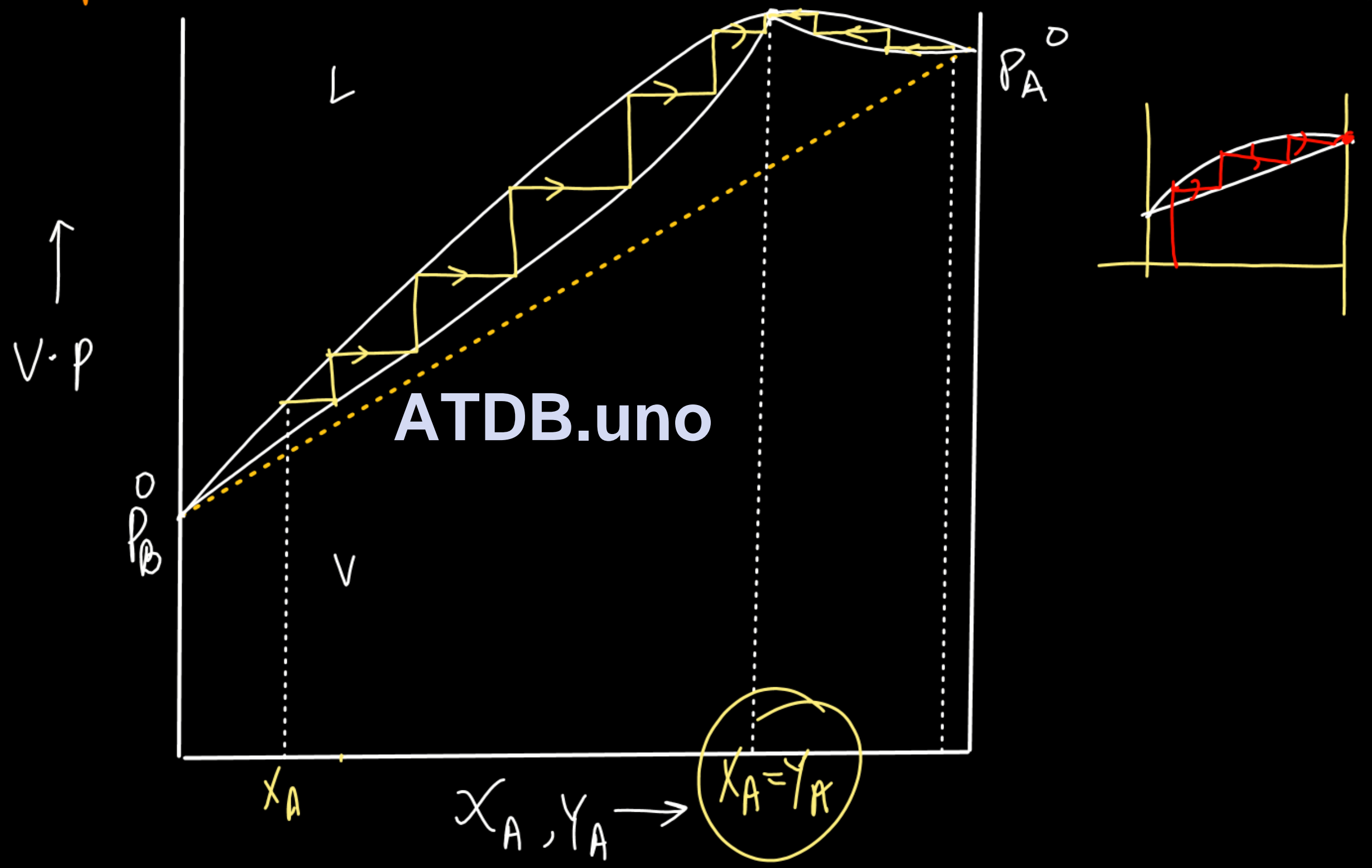
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Distillation of a non-ideal solution of Liq, A and Liq, B



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Pressure-Composition Curve for a strongly positive deviated solⁿ



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Azeotropic Mixture



* A binary solution containing two volatile liquids in which both liquid and vapour have same composition.

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* A boiling liquid mixture at the azeotropic composition produces the vapours of exactly same composition as that of liquid. **ATDB.uno**

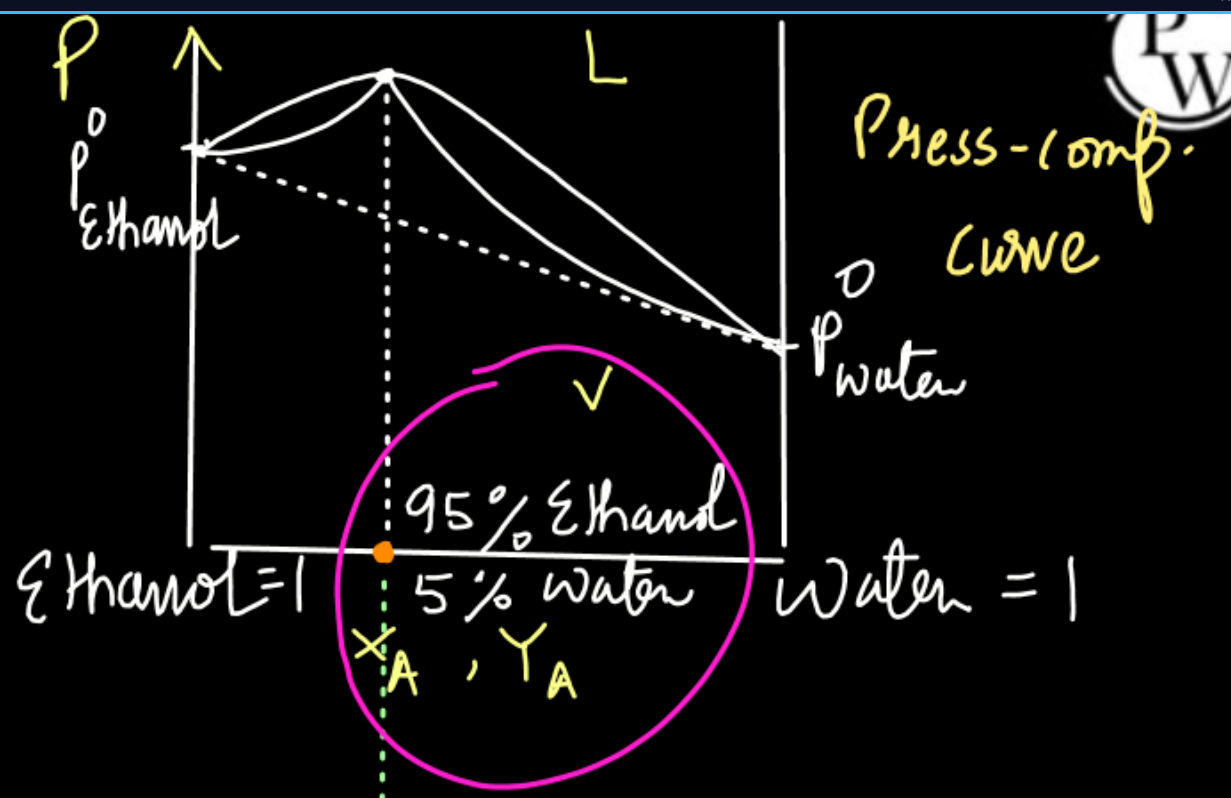
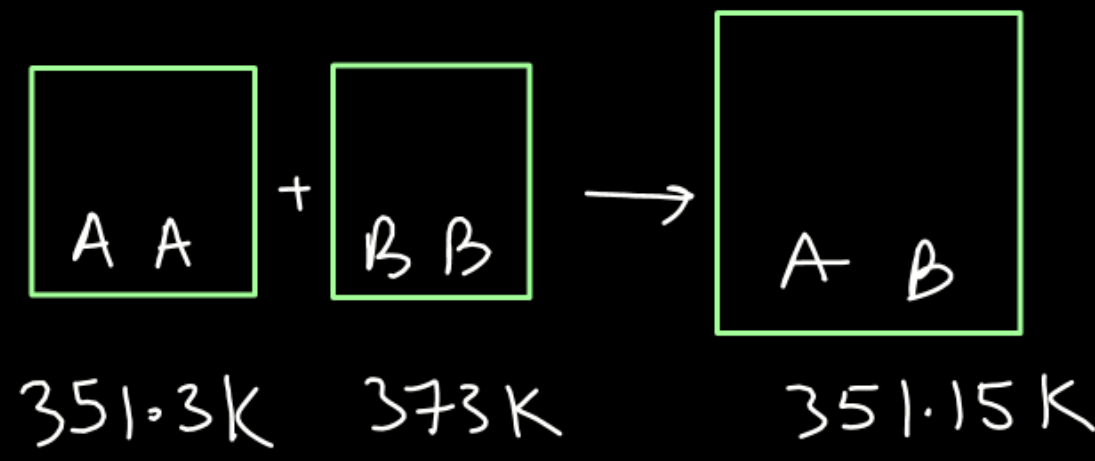


*

Composition of liquid mixtures at which distillation can not separate the two liquids because the condensate has the same composition as that of azeotropic liquid.

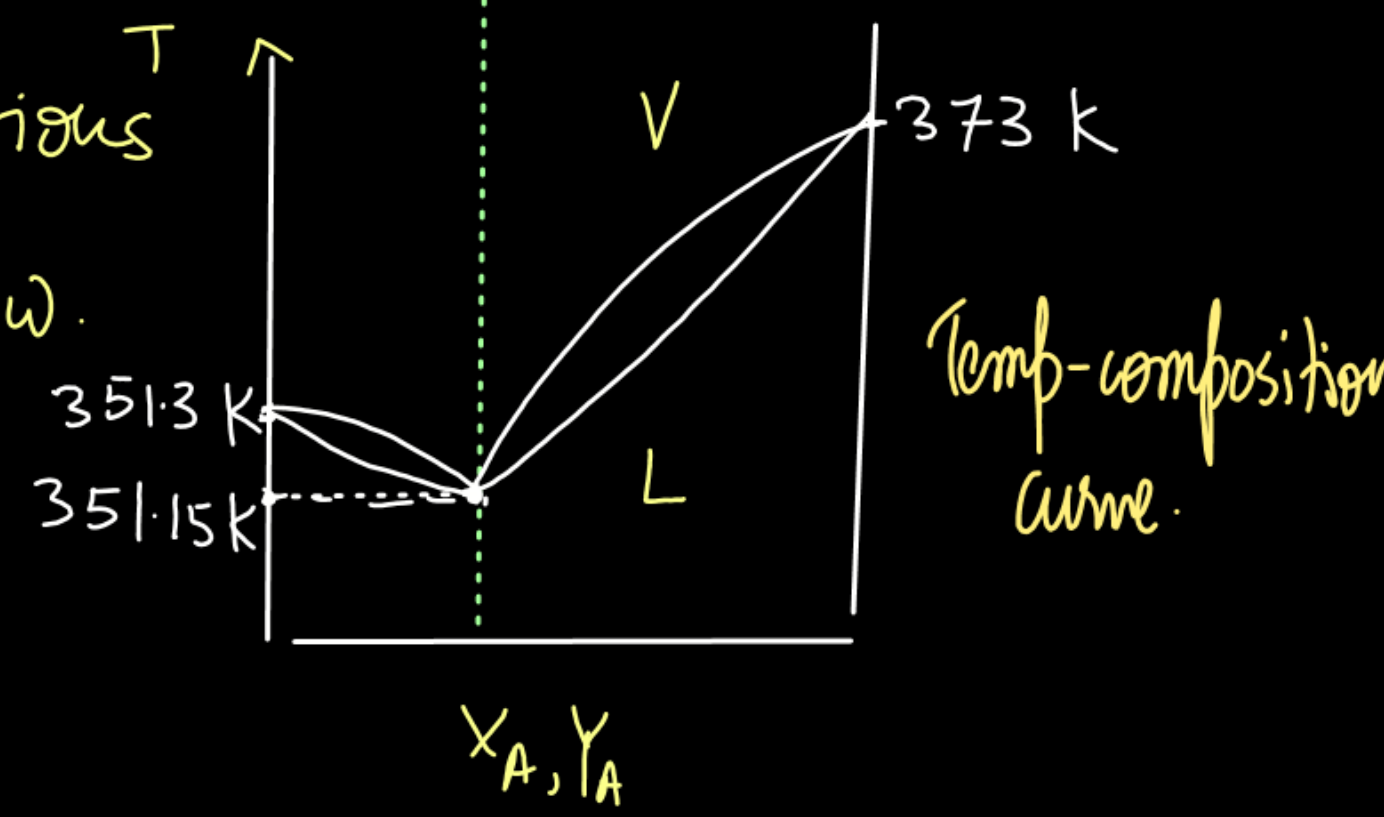
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Minimum Boiling Azeotropes

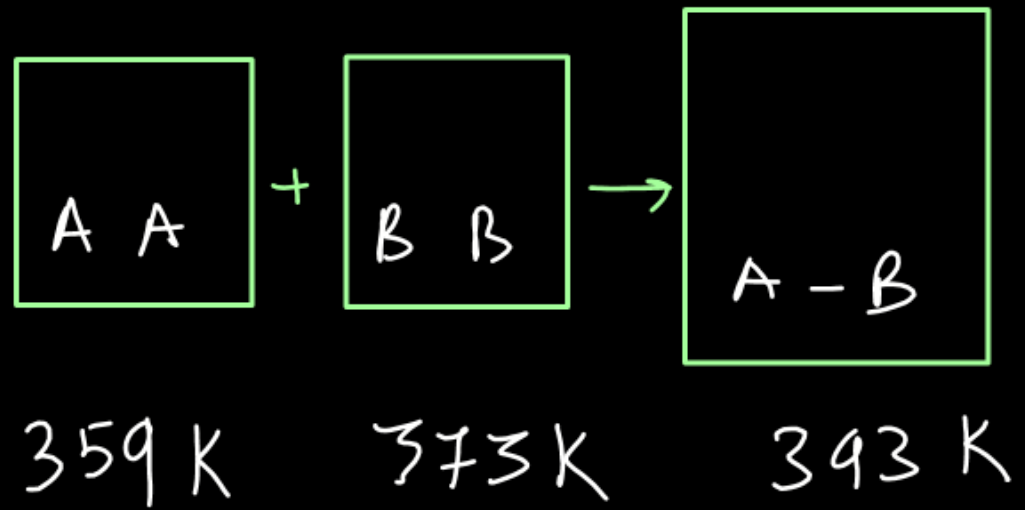


* These Azeotropes are formed by the solutions having large (+)ve deviation from Raoult's law.

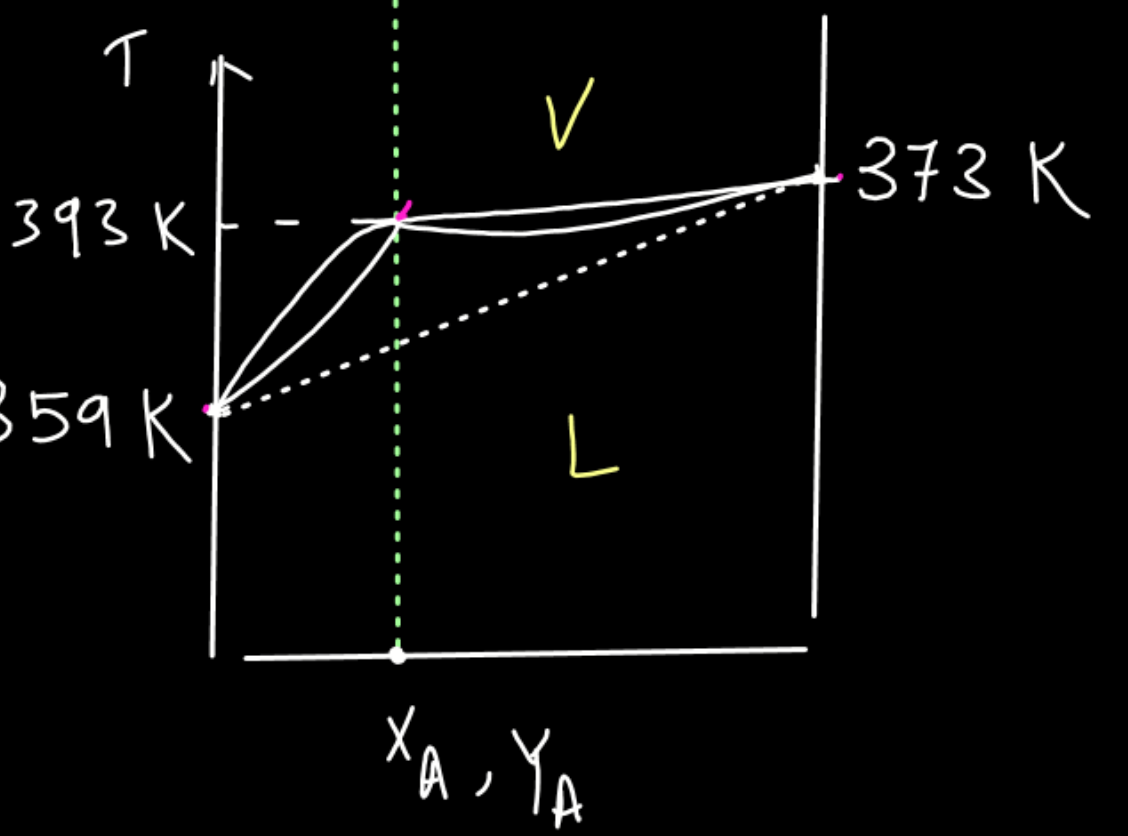
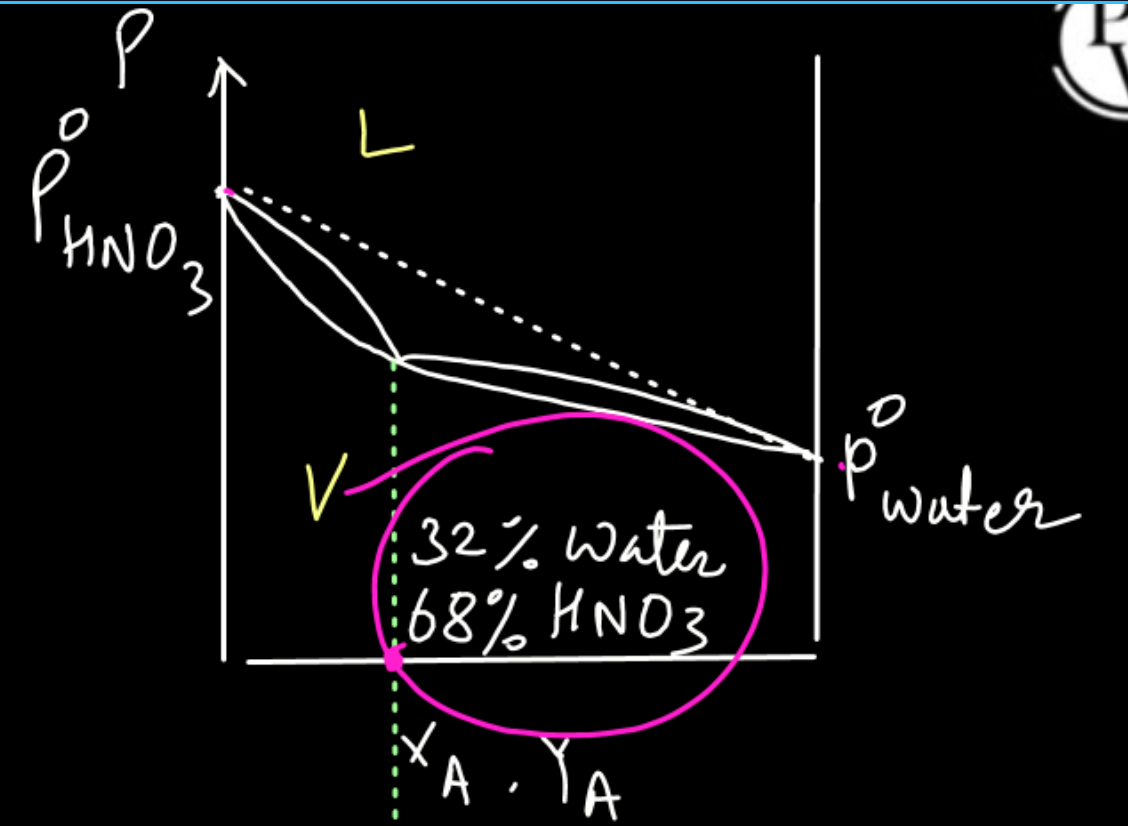
* Boiling point of the solution is less than the B.P of either component.



Maximum Boiling Azeotropes



- * These are formed by the solutions which show (-)ve deviation from Raoult's law.
- * Boiling point of this azeotropic mixture is more than the either component.





Question

Mixture of Phenol and Aniline shows

- A Positive Deviation
- B Zero Deviation
- C Negative Deviation
- D Can't Predict

M.W.

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THANK YOU

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