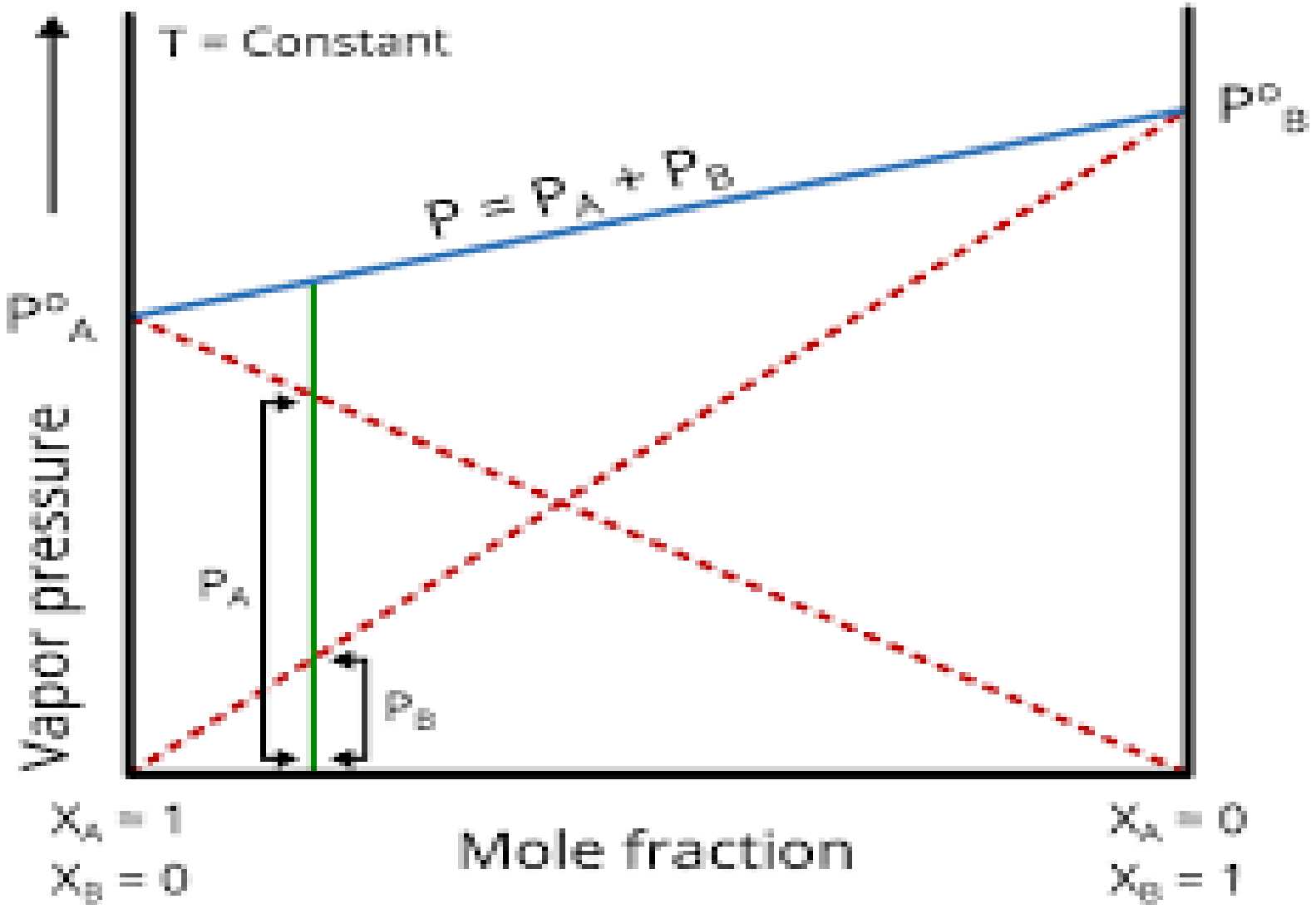
# Ideal solution
# and
# Rault's law

# Rault's law

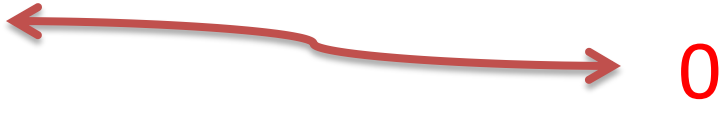
- The partial vapor pressure (Pi) of each volatile constituents in ideal solution is equal to vapor pressure of the pure constituent Pºi multiplied by the mole fraction (Xi) in the solution.
- $P_A = X_A * P^0_A$ , $P_B = X_B * P^0_B$
- $X_A = n_A/(n_A+n_B)$, $X_B = n_B/(n_A+n_B)$
- $X_A + X_B = 1$

- The total vapor pressure $P_t$ is
- $P_t = P_A + P_B$
- $P_t = P^0_A * X_A + P^0_B * X_B$


T = Constant
$P^{o}_{B}$
$P = P_A + P_B$
$P^{o}_{A}$
Vapor pressure
$P_A$
$P_B$
$X_A = 1$
$X_B = 0$
Mole fraction
$X_A = 0$
$X_B = 1$

- The vapor pressure (V.P.) is quantitative expression of escaping tendency (free energy) of each constituent
- For example:
- When Xi of more volatile constituent increased ↑so the total Pt increased ↑
- When Xi of less volatile constituent increased ↑the total pressure Pt decreased ↓

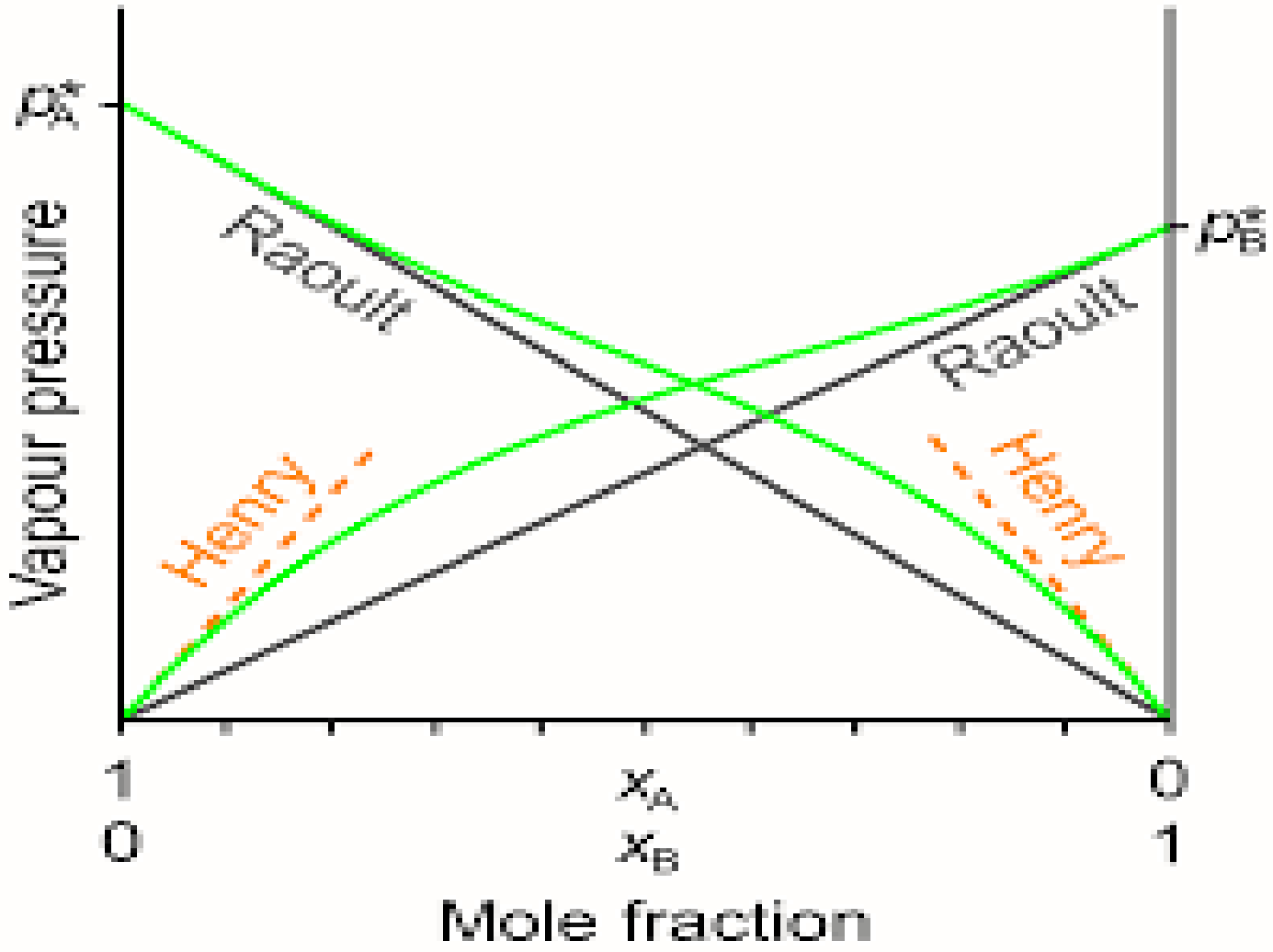
- Raoult's law does not apply in real solution
- But may be in very dilute real solution, when the solvent in high X→ 1
- So raoult's law will expressed as:
- $P_{solvent} = X_{solvent} P^0_{solvent}$
- $Pt = P_{solvent}$ because $X_{solvent} >> X_{solute}$
- Or $X_{solute} \rightarrow 0$
- $Pt = X_{solvent} P^0_{solvent} + X_{solute} P^0_{solute}$



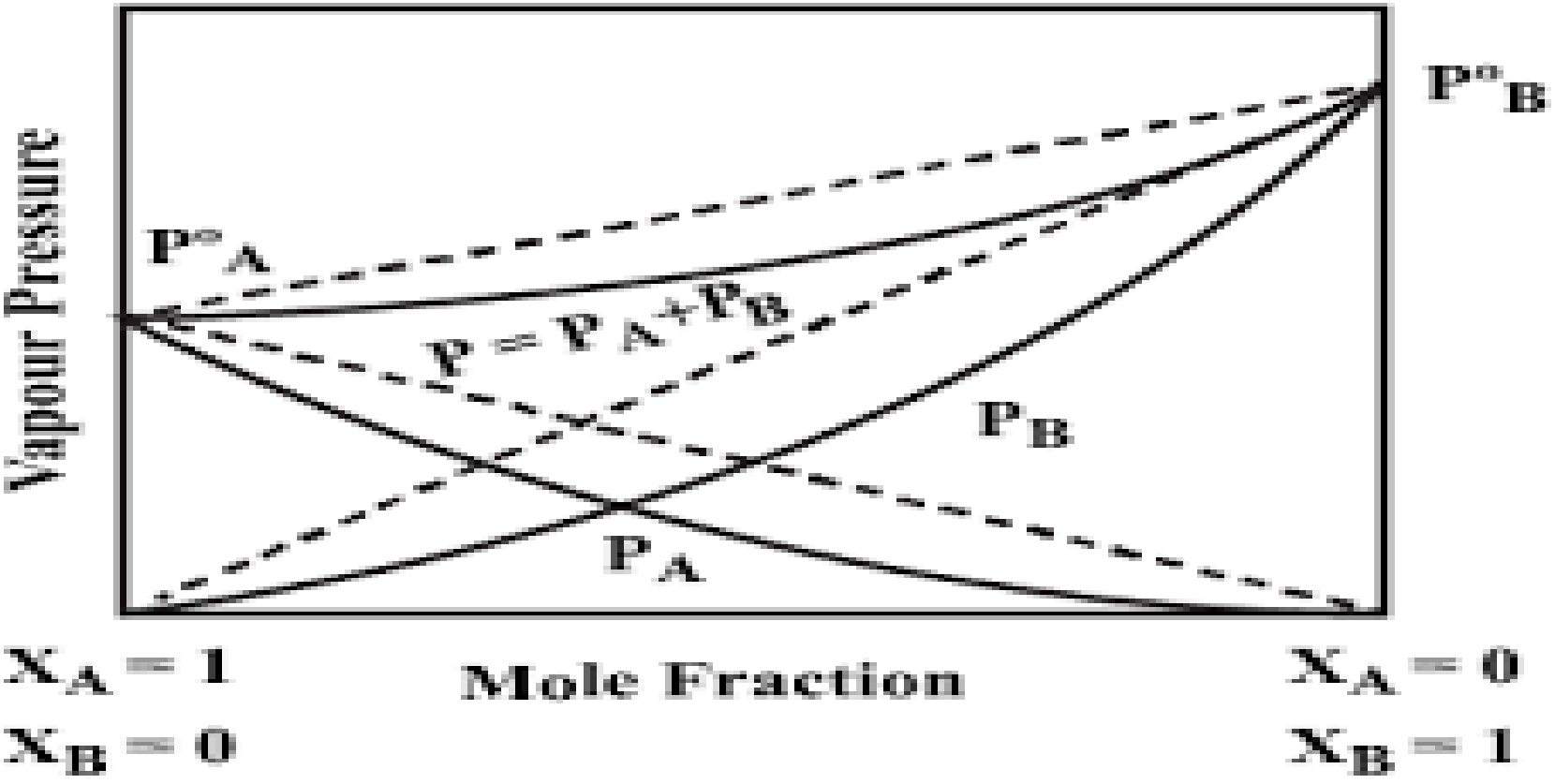
# Henry's law

- For real solution
- Form Raoult's law the +ev or –ev deviation at low Xi of each constituent, the v.p. (Pi) or escaping tendency will proportional to its Xi.
- But the proportionality constant is not $^{o}Pi$
- The v.p. (Pi) of each constituent (solute) can be expressed by Henry's law:
- $P_{solute} = X_{solute} K_{solute,}$ $K_{solute} \neq P^{o}_{solute}$

# Positive deviation

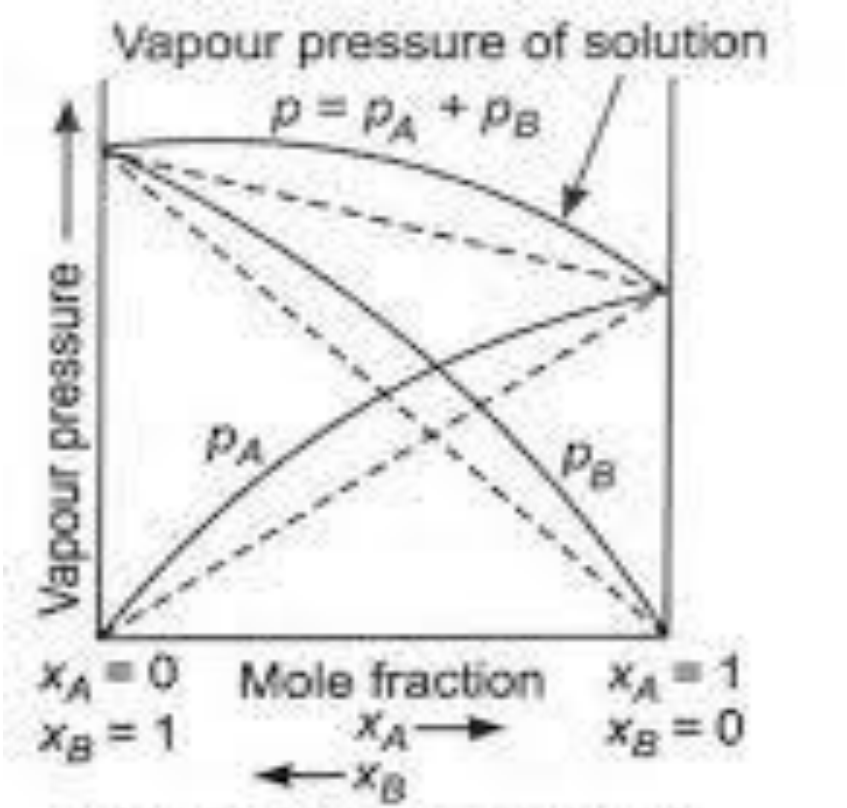


# Negative deviation

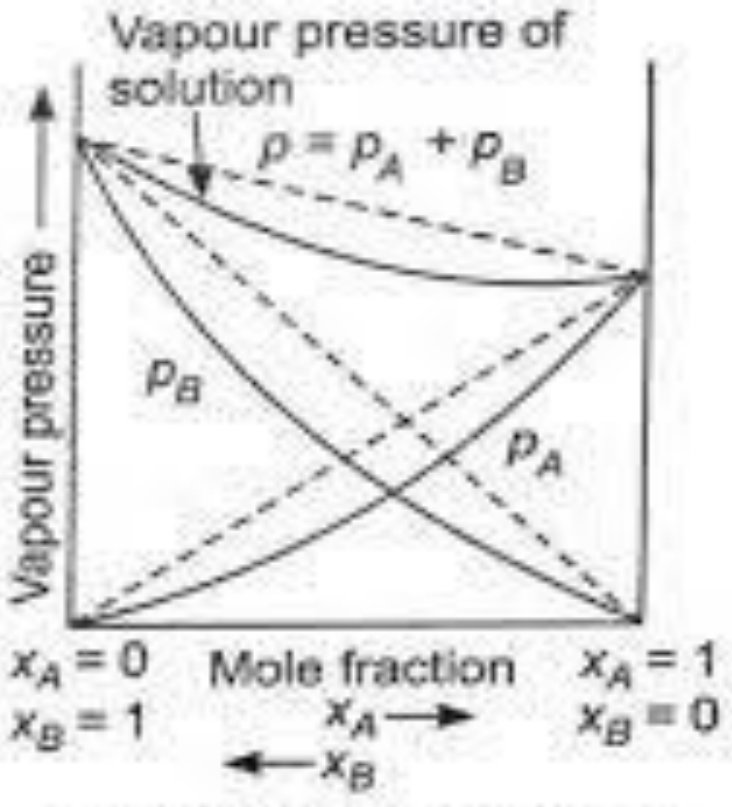



Negative deviation from Raoult's law behaviour

# +ev and –ev deviation




Vapour pressure diagram showing positive deviation




Vapour pressure diagram showing negative deviation