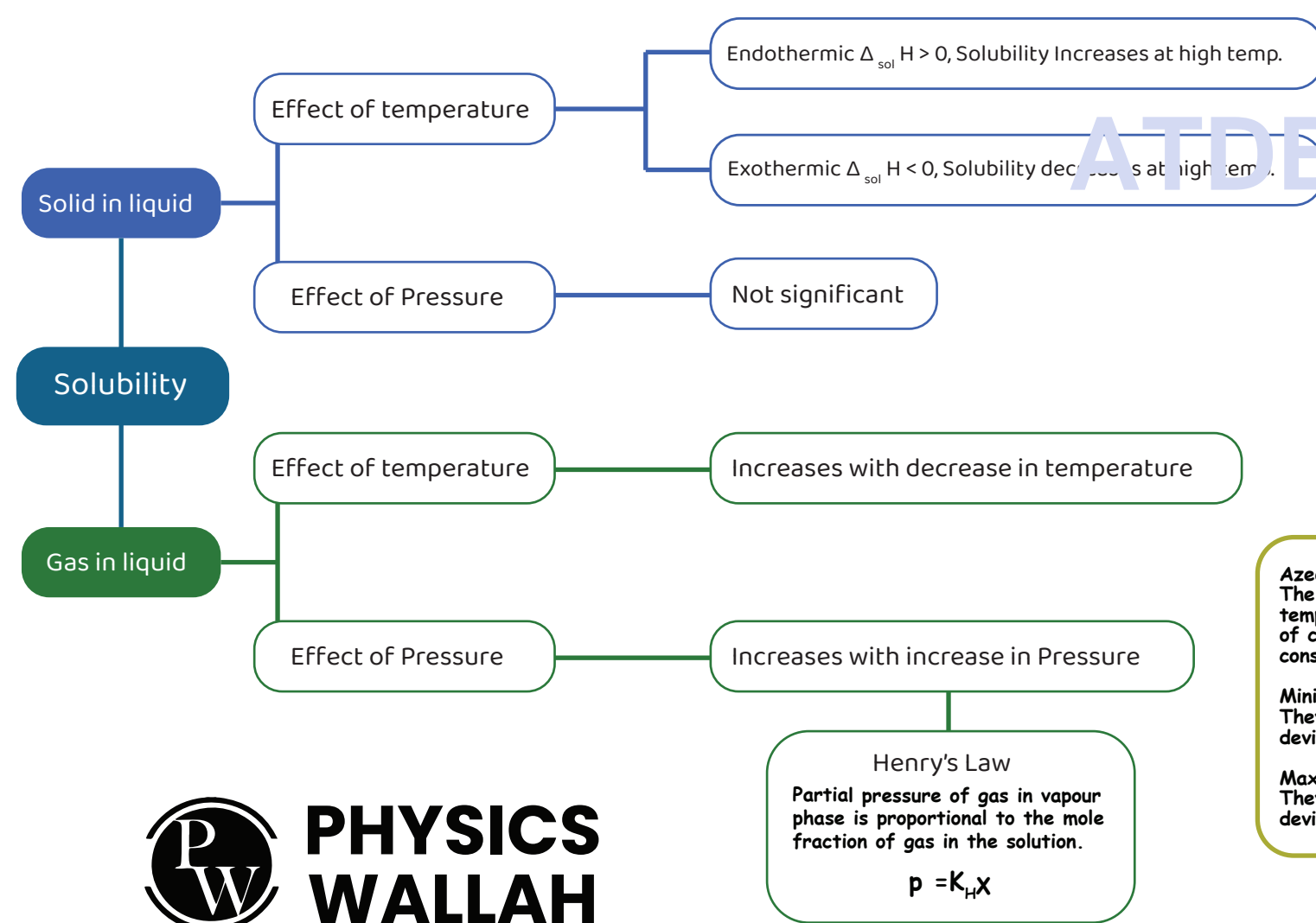


# SOLUTIONS



### Colligative properties

- Osmotic pressure →  $\pi = CRT$
- Depression in freezing point →  $\Delta T_f = \frac{K_f \times W_2 \times 1000}{M_2 \times W_1}$
- Elevation of boiling point →  $\Delta T_b = \frac{K_b \times 1000 \times W_2}{M_2 \times W_1}$
- Relative lowering of vapour pressure (for ideal solutions) →  $\frac{W_2 \times M_1}{M_2 \times W_1} = \frac{P_1^0 - P_1}{P_1^0}$

### Abnormal molecular mass

Molecular mass different from expected value

Van't Hoff factor (i) =  $\frac{\text{Normal molar mass}}{\text{Abnormal molar mass}}$

### Raoult's Law

For any solution, the partial vapour pressure of each volatile component is directly proportional to its mole fraction in solution phase

- Obey Raoult's law  
 Ideal solution →  $\Delta H_{\text{mix}} = \Delta V_{\text{mix}} = 0$   
 eg: n-hexane and n-heptane, Ethyl bromide + Ethyl chloride, Chlorobenzene + Bromobenzene, etc.
- Do not Obey Raoult's law  
 Non-Ideal solution →  $\Delta H_{\text{mix}} \text{ or } \Delta V_{\text{mix}} \neq 0$

### Azeotropes:

The mixtures of liquids which boil at constant temperature like a pure liquid and possess same composition of components in liquid as well as vapour phase are called constant boiling mixtures or azeotropic mixtures.

- Minimum boiling azeotropes:** They are formed by those liquid pairs which show positive deviations from ideal behaviour. eg: ethanol-water mixture.
- Maximum boiling azeotropes:** They are formed by those liquid pairs which show negative deviations from ideal behaviour e.g nitric acid-water mixture.

### Positive Deviation

$\Delta H_{\text{mix}} > 0$   
 $\Delta V_{\text{mix}} > 0$

eg: Acetone + Ethyl alcohol, Water + Ethyl alcohol, Carbon tetrachloride + Chloroform, Chloroform + Ethanol, Acetone + Carbon disulphide, Acetone + Benzene, etc.

### Negative Deviation

$\Delta H_{\text{mix}} < 0$   
 $\Delta V_{\text{mix}} < 0$

eg: Acetone + Aniline, HCl + H<sub>2</sub>O, HNO<sub>3</sub> + H<sub>2</sub>O, H<sub>2</sub>SO<sub>4</sub> + H<sub>2</sub>O, Acetone + Chloroform, HNO<sub>3</sub> + Chloroform, Benzene + Chloroform, Pyridine + Glacial acetic acid, etc.

