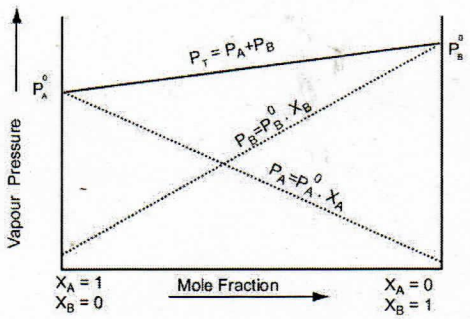
Chapter 2
Solutions

1. Sate Raoultís law and Henrys law?
According to Raoult's Law, for a solution of volatile liquids, the partial vapor pressure of each component (volatile) of the solution is proportional to the mole fraction of that component present in the solution.$\mathbf{P_1 \alpha x_1}$, $\mathbf{P_1 = P_1^0 x_1}$,
According to Henry's law the solubility of gas in a liquid is directly proportional to the pressure of the gas Mathematically mass of the dissolved gas proportional to pressure of the gas $P=K_H X$

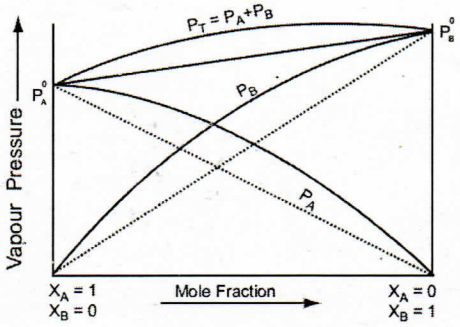
2. What are ideal solutions and *non ideal solution*
Ideal solutions Obey Raoult's law at every range of concentration while *non ideal solution* do not obey Raoult's law at every range of concentration

3. What is meant by positive and negative deviations from Raoult's law and how is the sign of $\Delta_{sol}H$ related to positive and negative deviations from Raoult's law?
According to Raoult's law, the partial vapour pressure of each volatile component in any solution is directly proportional to its mole fraction. The solutions which obey Raoult's lawover the entire range of concentration are known as ideal solutions.

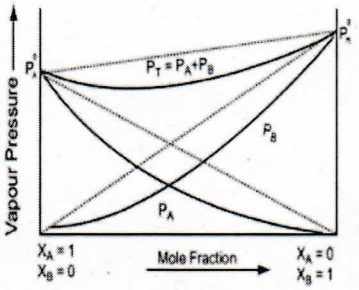
The solutions that do not obey Raoult's law (non-ideal solutions) have vapour pressures either higher or lowerthan that predicted by Raoult's law. If the vapour pressure is higher, then the solution is said to exhibit positive deviation, and if it is



Vapour Pressure Diagram for Ideal Solution



Positive Deviations



lower, then the solution is said to exhibit negative deviation from Raoult's law.

In the case of an ideal solution, the enthalpy of the mixing of the pure components for forming the solution is zero.
$\Delta_{sol}H = 0$

In the case of solutions showing positive deviations, absorption of heat takes place.
$\Delta_{sol}H$ = Positive
In the case of solutions showing negative deviations, evolution of heat takes place.
$\Delta_{sol}H$ = Negative

A few examples of ideal solutions are as follows. Ethyl bromide + Ethyl iodide , Benzene + Toluene , n-Hexane + n-Heptane

A few more examples of non-ideal solutions showing negative deviations from Raoult's law are as follows. Benzene + Chloroform,Aniline + Acetone ,Water +Hcl,Water + HNO_3,Diethyl either + Chloroform

A few more examples of non-ideal solutions showing positive deviations from Raoult's law are as follows.Ethanol + Cyclohexane ,Acetone + Carbon disulphide Acetone + Benzene , Carbon tetrachloride + Chloroform

Ideal solution	Non Ideal solution	
Obey Raoult's law	Do not obey Raoult's law (there are two types of deviations +ve and -ve)	
	Positive deviation	Negative Deviation
ΔH mix is zero ΔV mix is zero	ΔH mix is +ve ΔV mix is +ve	ΔH mix is -ve ΔV mix is -ve

4. What are colligative properties?
Colligative properties are "properties of a solution that depends on the number of solute particles
The four Colligative Properties are stated below:

Relative lowering of vapour pressure depression , Boiling point elevation, Melting point depression, Osmotic pressure.

5. Why is liquid ammonia bottle rest cooled in ice before opening it ?
At room temperature, the vapour pressure of liquid ammonia is very high. On cooling vapour pressure decreases, therefore the liquid ammonia will not splash out.

6. Which colligative property is preferred for the molar mass determination of macromolecules ?
Osmotic pressure measurement is preferred for molar mass determination because :(a) even in dilute solution the osmotic pressure values are appreciably high andcan

be measured accurately.(b) osmotic pressure can be measured at room temperature.

7. Define Osmotic pressure ?

Osmotic pressure : The excess pressure applied to solution side to stop the process of osmosis is known as osmotic pressure.

8. What is meant by abnormal molecular mass ?

Certain solutes in certain solvents give rise to abnormal values of colligative properties and abnormal values for molecular masses

9. What are the reasons for abnormal molecular masses?

Association and dissociation of molecules

10. Why NaCl is used to clear snow from roads ?

It lowers freezing point of water.

11. Why the boiling point of solution is higher than pure liquid ?

Due to lowering in vapour pressure.

12. What is Vanít Hoff factor ?

It is the ratio of normal molecular mass to observed molecular mass. It is denoted as

i = normal molecular mass/observed molecular mass

= no. of particles after association or dissociation/no. of particles before the experiment

13.What are Azeotrope,?

Azeotrope, in chemistry, a mixture of liquids that has a constant boiling point because the vapour has the same composition as the liquid mixture. The boiling point of an azeotropic mixture may be higher or lower than that of any of its components.

14. What role does the molecular interaction play in solution containing chloroform and acetone ?

Hint : H-bonding formed, results in negative deviation from Raoultís law.

15. What role does the molecular interaction play in the solution of alcohol and water ?

Positive deviation from ideal behaviour.