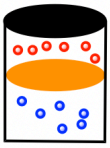
CONCEPT: VAPOR PRESSURE LOWERING (RAOULT'S LAW)

- The pressure exerted by a gas that is in equilibrium with its liquid phase at a specific temperature within a closed system.

Vapor Pressure (Raoult's Law)

Vapor Pressure

The **Pressure** exerted by a ____ at the surface of a liquid.



Vapor Pressure Lowering Formula

$P_{Soln} = X_{Solv} \cdot$ _____

$$X_{Solvent} = \frac{\text{moles of } \_\_\_\_\_}{i(\text{moles of } \_\_\_\_\_) + \text{moles of } \_\_\_\_\_}$$

Variables

- ☐ _____ = Pressure after adding solute to solvent
- ☐ _____ = Van't Hoff Factor
- ☐ _____ = Mole Fraction of solvent
- ☐ _____ = Pressure of pure solvent

□ Since adding solute lowers the vapor pressure: _____ is always less than _____.

EXAMPLE: Calculate the vapor pressure (in torr) of a solution containing 53.7 g $Cd(NO_3)_2$ (MW: 236.43 g/mol) in 155 g of water at 30.0ºC. The vapor pressure of pure water at this temperature is 131.8 torr.

PRACTICE: How many grams of glucose, $C_6H_{12}O_6$, must be added to 515.0 g of water to give a solution with a vapor pressure of 13.2 torr at 20.0ºC? The vapor pressure of pure water at 20.0ºC is 17.5 torr.

a) 9.54×10^2 g b) 1.68×10^3 g c) 5.29 g d) 9.31 g

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PRACTICE: Determine the vapor pressure lowering associated with 1.32 m $C_6H_{12}O_6$ solution (MW: 180.156 g/mol) at 25ºC. The vapor pressure of pure water at 25ºC is 23.8 torr.

a) 0.553 torr b) 27.6 torr c) 23.2 torr d) 0.976 torr

PRACTICE: The vapor pressure of water at 100.0ºC is 0.720 atm. Determine the mass percent of iron (II) chloride, $FeCl_2$, needed to reduce its vapor pressure to 0.655 atm. (MW of $FeCl_2$ is 126.756 g/mol)

a) 67.7% b) 18.9% c) 22.5% d) 58.3%