**Dougherty Valley HS AP Chemistry**

**WORKSHEET #3**

**Solutions – Raoult’s Law Non-volatile solutes**

**Name: Date: Period: Seat #:**

Show all work and/or explain using chemistry principles. Box your final numerical answers.

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| **#1:** What is the vapor pressure of an aqueous solution that has a solute mole fraction of 0.1000? The vapor pressure of water is 25.756 mmHg at 25 °C. [**23.18 mmHg**] |
| **#2:** The vapor pressure of an aqueous solution is found to be 24.90 mmHg at 25 °C. What is the mole fraction of solute in this solution? The vapor pressure of water is 25.756 mm Hg at 25 °C. [**0.03324**]  |
| **#3**: How many grams of nonvolatile compound B (molar mass= 97.80 g/mol) would need to be added to 250.0 g of water to produce a solution with a vapor pressure of 23.756 torr? The vapor pressure of water at this temperature is 42.362 torr. [**1063 g** - Comment: this is a completely ridiculous amount to dissolve in 250.0 g of water, but that's not the point. The point is to solve the problem.] |
| **#4:** At 29.6 °C, pure water has a vapor pressure of 31.1 torr. A solution is prepared by adding 86.8 g of "Y", a nonvolatile non-electrolyte to 350. g of water. The vapor pressure of the resulting solution is 28.6 torr. Calculate the molar mass of Y. [**51.1 g/mol**] |
| **#5:** The vapor pressure of pure water is 23.8 mmHg at 25.0 °C. What is the vapor pressure of 2.50 molal C6H12O6 [**22.8 mmHg**] |
| **#6:** How many grams of testosterone, C19H28O2, a nonvolatile, nonelectrolyte (MW = 288.4 g/mol), must be added to 207.8 grams of benzene to reduce the vapor pressure to 71.41 mm Hg? (Benzene = C6H6 = 78.12 g/mol. The vapor pressure of benzene is 73.03 mm Hg at 25.0 °C.) **[17.4 g**] |
| **#7:** At 25.0 °C, the vapor pressure of benzene (C6H6) is 0.1252 atm. When 10.00 g of an unknown non-volatile substance is dissolved in 100.0 g of benzene, the vapor pressure of the solution at 25.0 °C is 0.1199 atm. Calculate the mole fraction of solute in the solution, assuming no dissociation by the solute. [**0.04233**] |
| **#8:** What is the vapor pressure at 25.0 °C of a solution composed of 42.71 g of naphthalene (a non-volatile compound, MW = 128 g/mol) and 40.65 g of ethanol (MW = 46.02 g/mol). (The vapor pressure of pure ethanol at 25.0 °C is 96 torr. ) [**70. Torr**] |
| **#9:** A nonvolatile organic compound Z was used to make up a solution. Solution A contains 5.00 g of Z dissolved in 100. g of water and has a vapor pressure of 754.5 mmHg at the normal boiling point of water. Calculate the molar mass of Z. [**124 g/mol**] |
| **#10:** What is the molality of an aqueous solution of urea, CO(NH2)2, if the vapor pressure above the solution is 22.83 mmHg at 25 °C? Assume that urea is non-volatile. The vapor pressure of pure water is 23.77 mmHg at 25 °C [**2.31 m**] |