CHM 1046 - JOENS WORKSHEET #1 Due date: Monday, August 27th
WORKSHEETS ARE DUE AT THE BEGINNING OF CLASS ON THE DATE GIVEN ON THE WORKSHEET. LATE WORKSHEETS WILL NOT BE ACCEPTED.

NAME _____ Panther ID _____

For problems involving calculations you must show your work for credit.

1) Which of the following mixtures of pure chemical substances would be expected to form a solution?
a) A mixture of oxygen gas (O_2) and nitrogen gas (N_2)
b) A mixture of potassium nitrate (KNO_3) and liquid water (H_2O)
c) A mixture of liquid cyclohexane (C_6H_{12}) and liquid water (H_2O)
d) both a and b
e) both a and b and c

_____D_____

Gases (if they do not react with one another) will always mix homogeneously. Potassium nitrate is a soluble ionic compound and so will form a solution when added to water. Since cyclohexane is a hydrocarbon (contains only C and H) it is nonpolar, and so will not for a solution with a polar liquid like water. Therefore the correct answer id D.

2) A liquid solution of methyl alcohol (CH_3OH, MW = 32.03 g/mol) and water (H_2O, MW = 18.02 g/mol) is 16.35 % by mass methyl alcohol. The density of the solution (at T = 20.0 °C) is D = 0.9721 g/cm^3. What are the molarity, molality, and mole fraction of methyl alcohol in the solution?

Assume 100.00 g solution. Then there are 16.35 g of methyl alcohol (MA) and 83.65 g of water (W).

$$\text{mol M} = 16.35 \text{ g MA} \frac{1 \text{ mol}}{32.03 \text{ g}} = 0.5105 \text{ mol MA}$$

$$\text{mol W} = 83.65 \text{ g W} \frac{1 \text{ mol}}{18.02 \text{ g}} = 4.642 \text{ mol W}$$

$$\text{volume of solution} = 100.00 \text{ g} \frac{1 \text{ cm}^3}{0.9721 \text{ g}} = 102.87 \text{ cm}^3 = 102.87 \text{ mL} = 0.10287 \text{ L}$$

So $$\text{molarity} = \frac{\text{moles MA}}{\text{L solution}} = \frac{0.5105 \text{ mol MA}}{0.10287 \text{ L soln}} = 4.963 \text{ mol/L}$$

$$\text{molality} = \frac{\text{moles MA}}{\text{kg W}} = \frac{0.5105 \text{ mol MA}}{0.08365 \text{ kg W}} = 6.103 \text{ mol/kg}$$

$$\text{mol fraction MA} = \frac{\text{mol MA}}{\text{total moles}} = \frac{0.5105 \text{ mol}}{(0.5105 + 4.642 \text{ mol})} = 0.0991$$