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

Directions: Show all work and/or explain using chemistry principles and AP level detail.

1) A solution of salt (molar mass 90 g mol-1) in water has a density of 1.29 g/mL. The concentration of the salt is 35% by mass. Assume a 100 g sample.

   a. Calculate the molarity of the solution. _5.0 M_

   b. Calculate the total number of moles in the solution. _4.0 M_

   c. Calculate the mole fraction of the salt in the solution. _0.10_

2) Ethylene glycol ($C_2H_4(OH)_2$; 150g) is added to ethanol (C_2H_5OH; 250g)

   a. Calculate the mass % of ethylene glycol in the solution. _37.5%_
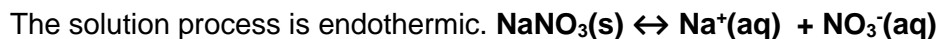
   b. Calculate the mole fraction of ethylene glycol in the solution. _0.31_

3) Concentrated sulfuric acid contains very little water, only 5% by mass. It has a density of 1.84 g/mL. What is the molarity of this acid? _17.8M_

4) The lattice energy of a salt is 350 kJ/mol and the solvation energies of its ions add up to 320 kJ/mol for the preparation of a 0.50 M solution. In the preparation of this solution would the solution get colder or water? What is the driving force for this solution process?

5) Addition of excess sodium nitrate to water to form a saturated solution results in the following equilibrium. The solution process is endothermic. **$NaNO_3(s) \leftrightarrow Na^+(aq) + NO_3^-(aq)$**
Which of the following could increase the concentration of sodium nitrate in the solution?
Circle your choice. Then explain why or why not for each:

    a. Add more $NaNO_3(s)$

        Increase [NaNO₃]   *yes*   or   *no*   <u>*Why?*</u>

    b. Increase the pressure on the solution

        Increase [NaNO₃]   *yes*   or   *no*   <u>*Why?*</u>

    c. Increase the temperature

        Increase [NaNO₃]   *yes*   or   *no*   <u>*Why?*</u>

    d. Stir the solution more vigorously

        Increase [NaNO₃]   *yes*   or   *no*   <u>*Why?*</u>

6) Ethanol and methanol form an almost ideal solution. If 64g of methanol is mixed with 69 g of ethanol, what is the total vapor pressure above the solution? $P°_{methanol} = 90$ torr; $P°_{ethanol} = 45$ torr   *70.7 torr*