Name_____

TA Name _____

Lab Section #_____

ALL work must be shown to receive full credit. **Due at the beginning of lecture on Friday, September 14, 2001.**

PS3.1. Europium metal crystallizes in a body-centered cubic unit cell. The density of europium is $5.26 \frac{g}{cm^3}$. Calculate the edge length of the unit cell and the atomic radius of europium.

PS3.2. Aluminum crystallizes in a face-centered cubic unit cell and has a density of $2.70 \frac{g}{cm^3}$. What are the unit cell dimensions (edge length)?

PS3.2. Describe all the energy changes which must be considered in the solution process. Indicate the types of interactions which are important in the solution process and discuss what conditions favor and do not favor formation of a solution.

PS3.4. Which substance of each of the following pairs is likely to be more soluble in water? Explain each choice and, for the less soluble of each pair, suggest a better solvent.
   a) ethane(g) or acetic acid(l)

   b) chlorine(g) or hydrogen chloride(g)

   c) hexane(g) or $C_6H_{12}O_6$(s)

   d) ammonia(g) or phosphine(g)

PS3.5. Describe the attractive forces present when $NaCl_{(s)}$, $HCl_{(g)}$ and ethyl alcohol$_{(l)}$ (CH_3CH_2OH) dissolve in water. Use the space below to sketch diagrams depicting at the atomic level how each of the three substances interact with water molecules.

PS3.6. Describe how the solubility of an ionic solid can depend on temperature. Describe how the solubility of a gas can depend on temperature.

PS3.7. A solution of potassium dihydrogen phosphate, KH_2PO_4, contains 15.65 g KH_2PO_4 dissolved in 180. g water. The density of the solution is 1.058 g $\cdot mL^{-1}$. Calculate;

a) The weight percent KH_2PO_4 in the solution,

b) the mol fraction of KH_2PO_4 in the solution,

c) molality of KH_2PO_4 in the solution,

d) the molarity of KH_2PO_4 in the solution.

PS3.8. An aqueous solution of methyl alcohol, CH_3OH, is 13.4 molal and has a density of $0.953 \frac{g}{mL}$. Calculate the

a) weight percent methyl alcohol.

b) mole fraction of methyl alcohol.

c) molarity of the solution.

PS3.9. Describe how you would prepare the following aqueous solutions;
   a) 500.00 mL of a 0.250 M CsCl solution from solid CsCl and distilled water.

   b) 145 g of a 8.5 % (by weight) solution of $C_{12}H_{22}O_{11}$ from solid sucrose and distilled water

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   c) 950. g (grams of solution) of a 0.750 molal propylene glycol ($C_3H_8O_2$) solution.

PS3.10. A concentrated solution of NaOH in water is prepared by mixing 30.0 g NaOH with 70.0 g of water and cooled back to 25 ˚C . The molarity was found to be 9.975 M. Calculate
  a) the molality of the solution

  b) the density of the solution