CHEM 212, Exam 2 Name:_____
Fall 2012

1. (20 pts) For the forward reaction at 25°C $aA + bB \Leftrightarrow cC + dD$, the $\Delta H = -45$ kJ mol^{-1} and $\Delta S = 45$ J mol^{-1} K^{-1}.

a. Is this reaction **exothermic** or **endothermic**?

b. Does disorder **increase** or **decrease**?

c. Calculate Gibbs free energy

d. Is this reaction spontaneous?

e. Determine the equilibrium constant for this reaction.

2. (20 pts) Given that the solubility product for $La(IO_3)_3$ is 1.0×10^{-11}, what is the concentration of La^{3+} in a saturated solution of lanthanum iodate?

3. (20 pts) A 50 ml solution of 0.0319 M benzylamine was titrated with 0.050 M HCl. Calculate the pH at the following volumes of acid added: V_a= 0 ml, 12 ml, and ½ V_e. Given pK_a= 9.35

4. (20 pts) How many grams of Na_2CO_3 (FM= 105.99) should be mixed with 5.00 g $NaHCO_3$ (FM= 84.01) to produce 100 mL of buffer with pH=10? Given pK_a= 10.64

5. (20 pts) Cyanide solution (12.73 mL) was treated with 25.00 mL of 8.0×10^{-5} Ni^{2+} solution (containing excess Ni^{2+}) to convert the cyanide into tetracyanonickelate(II). Excess Ni^{2+} was then titrated with 10.15 mL 0.0001307 M EDTA. Assume $Ni(CN)_4^{2-}$ does not react with EDTA. Calculate the CN^- concentration in the original (12.73 mL) sample.

$$4CN^- + Ni^{2+} \rightarrow Ni(CN)_4^{2-}$$