CH 223 Exam Prep I Worksheet Name: _____

Worksheet due dates: **Mon, 4/29, 1:10 PM** *(01)* **, Wed, 5/1, 1:10 PM** *(H1)* ***or*** **11:59 PM** *(W1, email)*. To complete, show ***detailed steps*** on how to get the given answer for each problem. *Failure to use this form for work and answers will result in a point penalty.*

Problem 1: Consider the following equilibrium: **$2\ NOCl(g) \rightleftharpoons 2\ NO(g) + Cl_2(g)$** *where* **$K = 1.6 * 10^{-5}$**
1.0 mol of pure NOCl ***and*** 1.0 mol of pure Cl_2 are placed in a 1.00 L container. Calculate the equilibrium concentration of NO(g) and Cl_2(g). *To receive credit, show a complete ICE table.*

Answer to Problem #1: **$[NO(g)] = 4.0 * 10^{-3}$ M, $[Cl_2(g)] = 1.0$ M**

Problem 2: How many moles of benzoic acid, a monoprotic acid with $K_a = 6.4 * 10^{-5}$, must be dissolved in 500. mL of H_2O to produce a solution with pH = 2.50?

Answer to Problem #2: **$7.9 * 10^{-2}$ mol** *(answers ±0.1 ok, depends on method used to solve)*

Problem 3: Complete the following problems using correct significant figures:

$[H^+] = 0.001501$ M, and pH = _____ $pK_b = 10.35$, and K_b = _____

Problem 4: You have solutions of 0.200 M HNO_2 and 0.200 M KNO_2 (K_a for $HNO_2 = 4.00 * 10^{-4}$). A buffer of pH 3.00 is needed. What volumes of HNO_2 and KNO_2 are required to make 1 liter of buffered solution? *(Hints: 1000 mL = $V_{wa} + V_{wb}$* ***and:*** *rewrite Henderson-Hasselbalch, substituting n_{wb}/n_{wa} for $C_{wb}V_{wb}/C_{wa}V_{wa}$ (because $n_{wa} = C_{wa}V_{wa}$, etc.))*

Answer to Problem #4: **715 mL of HNO_2 and 285 mL of KNO_2, ±1 mL ok**

Problem 5: What is the pH of a solution that results when 0.010 mol HNO_3 is added to 500. mL of a solution that is 0.10 M in aqueous ammonia and 0.20 M in ammonium nitrate? Assume no volume change, and K_b for $NH_3 = 1.8 * 10^{-5}$)

Answer to Problem #5: **pH = 8.82**

Problem 6: You dissolve 1.00 g of an unknown diprotic acid in 200.0 mL of H_2O. The solution is just neutralized by 5.00 mL of a 1.00 M NaOH solution. What is the molar mass of the unknown acid?

Answer to Problem #6: **400. g/mol**