WHITE

Quiz 1 Name: _____
Chem 101A 3 September 2009

1. **Find the pH for each of the following: (12 points)**

a. **0.25 *M* HCO_2H**

$$\frac{x^2}{0.25-x} = 1.8\times10^{-4}$$

using approx $\frac{x^2}{0.25} = 1.8\times10^{-4}$

$x = 6.71\times10^{-3}\ M = [H^+]$

(Approx is valid since x is 2.68% of 0.25)

pH = 2.17

b. **0.520 *M* $NaCO_2H$**

$[CO_2H^-] = 0.520\ M$

$CO_2H^- + H_2O \rightleftharpoons OH^- + HCO_2H$

$K_b = \frac{K_w}{1.8\times10^{-4}} = 5.56\times10^{-11} = \frac{[OH^-][HCO_2H]}{[CO_2H^-]} = \frac{x^2}{0.520-x}$

using approx, $x = 5.37\times10^{-6} = [OH^-]$

(valid → x is 0.001% of 0.520)

pOH = 5.27

pH = 8.73

2. **You want to prepare a buffer with pH = 8.75 from 0.15 *M* NH_4Cl and 0.10 *M* NH_3. Starting with 100.0 mL of 0.15 *M* NH_4Cl, how many milliliters of 0.10 *M* NH_3 must you add? (8 points)**

$pH = pK_a + \log\frac{[A^-]}{[HA]}$ for NH_4^+, $pK_a = 9.25$

$8.75 = 9.25 + \log\frac{[NH_3]}{[NH_4^+]}$

$-0.50 = \log\frac{[NH_3]}{[NH_4^+]} = \log\frac{n_{NH_3}}{n_{NH_4^+}}$

$0.316 = \frac{n_{NH_3}}{n_{NH_4^+}}$

In 100.0 mL 0.15 M NH_4Cl

$n_{NH_4^+} = 15.\ mmol$

$0.316 = \frac{n_{NH_3}}{15.\ mmol}$

$n_{NH_3} = 4.74\ mmol$

(conv to mL) $\times \frac{1\ mL}{0.10\ mmol}$

= 47 mL of 0.10 M NH_3