CHM 1046 - JOENS WORKSHEET #7 Due date: Monday, October 8th

WORKSHEETS ARE DUE AT THE BEGINNING OF CLASS ON THE DATE GIVEN ON THE WORKSHEET. LATE WORKSHEETS WILL NOT BE ACCEPTED.

NOTE: EXAM 2 is **Wednesday, October 10th**. It will cover Chapter 15, and Sections 16.1, 16.3, 16.4, and 16.5 of Chapter 16. This includes the Chapter 16 ppt slides 1-31, and the Chapter 16 problems 1-10.

NAME ______________________________ Panther ID ____________________________

For problems involving calculations you must show your work for credit.

1) For the acid-base reaction below, identify the acid, the base, the conjugate base of the acid, and the conjugate acid of the base.

$HNO_3(aq) + C_5H_5N(aq) \rightarrow C_5H_5NH^+(aq) + NO_3^-(aq)$

Acid ____HNO_3___________ Conjugate base ___NO_3^-_____________

Base ____C_5H_5N___________ Conjugate acid ___$C_5H_5NH^+$__________

2) For each of the following questions circle the correct answer. There may be more than one (or no) correct answer per problem.

A strong acid

HF HNO_2 **<u>HNO_3</u>** **<u>$HClO_3$</u>**

A strong soluble base

AgOH **<u>KOH</u>** $Cu(OH)_2$ $Fe(OH)_3$

3) An aqueous solution has pH = 3.91 at T = 25. °C. Find the pOH, $[H_3O^+]$ (concentration of hydronium ion), and $[OH^-]$ (concentration of hydroxide ion) for the solution.

pOH ___10.09_______ $[H_3O^+]$ ___1.2×10^{-4}_M___ $[OH^-]$ ___8.1×10^{-11}_M___

pOH = 14.00 – pH
= 14.00 – 3.91 = 10.09

$[H_3O^+] = 10^{-pH} = 10^{-3.91} = 1.2 \times 10^{-4}$ M
$[OH^-] = 10^{-pOH} = 10^{-10.09} = 8.1 \times 10^{-11}$ M

4) Find the pH of each of the following solutions (at T = 25. °C):

a) A 0.0300 M aqueous solution of hydrobromic acid (HBr), a strong acid.

$HBr(aq) \rightarrow H^+(aq) + Br^-(aq)$

$$[H^+] = \frac{0.0300 \text{ mol HBr}}{\text{L soln}} \; \frac{1 \text{ mol } H^+}{1 \text{ mol HBr}} = 0.0300 \text{ M}$$

$pH = - \log_{10}[H^+] = - \log_{10}(0.0300) = 1.52$

Note I have written the reaction for HBr in the Arrhenius acid/base picture, but could have also done this using the Bronsted acid/base definitions.

b) 400.0 mL of an aqueous solution containing 13.8 g of barium hydroxide ($Ba(OH)_2$), MW = 171.3 g/mol), a strong soluble base.

$Ba(OH)_2(s) \rightarrow Ba^{2+}(aq) + 2\ OH^-(aq)$

$$\text{moles } Ba(OH)_2 = 13.8 \text{ g} \; \frac{1 \text{ mol}}{171.3 \text{ g}} = 0.0806 \text{ mol}$$

$$[Ba(OH)_2] = \frac{0.0806 \text{ mol}}{0.4000 \text{ L}} = 0.2014 \text{ M}$$

$$[OH^-] = \frac{0.2014 \text{ mol } Ba(OH)_2}{\text{L soln}} \; \frac{2 \text{ mol } OH^-}{1 \text{ mol } Ba(OH)_2} = 0.403 \text{ M}$$

$pOH = - \log_{10}[OH^-] = - \log_{10}(0.403) = 0.39$

At T = 25.0 °C, pH + pOH = 14.00, so pH = 14.00 – pOH = 14.00 – 0.39 = 13.61