CHM152 Worksheet. (weak acids, weak bases, salts, and buffers) Name:_____

Work on separate paper. Be sure to write a chemical equation(s) for each problem. The answers to each problem are in parenthesis after each problem.

1. Calculate the pH of a 0.25 M solution of $NaNO_2$ ($K_a(HNO_2) = 4.5 \times 10^{-4}$) (1.97)

2. Calculate the pH of a 0.20 M solution of the weak base pyridine (C_5H_5N; $K_b = 1.7 \times 10^{-9}$) (9.26)

3. . What is the pH of a 0.20 M solution of sodium propionate, $NaC_3H_5O_2$? (For propionic acid, $HC_3H_5O_2$) $K_a = 1.3 \times 10^{-5}$.) (9.09)

4. Calculate the pH of a 0.20 M solution of ammonium nitrate, NH_4NO_3. (NH_3 $K_b = 1.8 \times 10^{-5}$) (4.98)

5. Calculate the pH of a buffer solution that contains 0.25 M benzoic acid ($C_6H_5CO_2H$) and 0.15 M sodium benzoate (C_6H_5COONa). Given Ka = 6.5×10^{-5} for benzoic acid. (3.97)

6. Calculate the pH of a buffer solution prepared by dissolving 0.20 mole of cyanic acid (HCNO) and 0.80 mole of sodium cyanate (NaCNO) in enough water to make 1.0 liter of solution. Ka(HCNO) = 2.0×10^{-4}. (3.0)

7. You have 500.0 mL of a buffer solution containing 0.20 M acetic acid (CH_3COOH) and 0.30 M sodium acetate (CH_3COONa). What will the pH of this solution be after the addition of 20.0 mL of 1.00 M NaOH solution? Ka = 1.8×10^{-5}. (5.07)

8. Which of the following mixtures will be a buffer when dissolved in a liter of water? Explain why each will or will not work.
   a. 0.1 mol $Ca(OH)_2$ and 0.3 mol HI

   b. 0.3 mol NaCl and 0.3 mol HCl

   c. 0.4 mol NH_3 and 0.4 mol HCl

   d. 0.2 mol HBr and 0.1 mol NaOH

   e. 0.2 mol H_3PO_4 and 0.1 mol NaOH

a. No, strong base and strong acid. b. No, strong acid and its salt. c. No, weak base, but adding equal moles of strong acid only results in the salt with no left over weak base. d. No, strong acid and strong base. e. Yes, weak acid and strong base, but the weak acid will be in excess and some of its conjugate base will be formed.