Problem Set 3 #1-10 KEY

1	
1. Calculate the pH of a 0.40 M solution of sodium hydroxide.	pH = 13.6
2	
2. Calculate the pH of a 0.40 M solution of barium hydroxide.	pH = 13.9
3	
3. Calculate the pH of the following solutions: a. 0.10 M NaOH b. 2.0 M NaOH c. 1.0×10^{-10} M NaOH	a) pH = 13 b) pH = 14.3 c) pH = 7 (trick question again!)
4	
4. Calculate the concentration of an aqueous $Sr(OH)_2$ solution that has a pH = 10.50.	$[Sr(OH)_2] = 1.58 \times 10^{-4}$M
5	
5. Write the reaction and the corresponding K_b equilibrium expression for each of the following substances acting as bases in water: a. NH_3 b. C_5H_5N	a) $NH_3 + H_2O \rightleftharpoons NH_4^{+1} + OH^{-1}$ $K_b = \frac{[NH_4^+][OH^-]}{[NH_3]}$ b) $C_5H_5N + H_2O \rightleftharpoons C_5H_5NH^{+1} + OH^{-1}$ $K_b = \frac{[C_5H_5NH^+][OH^-]}{[C_5H_5N]}$
6	
6. Use the table of weak acids and weak bases to help answer the following questions: a. Which is the stronger base, NO_3^- or NH_3? b. Which is the stronger base, H_2O or NH_3? c. Which is the stronger base, OH^- or NH_3? d. Which is the stronger base, CH_3NH_2 or NH_3?	a) NH_3 b) NH_3 c) OH^{-1} d) CH_3NH_2
7	
7. Calculate the pH of a 0.40 M solution of $(C_2H_5)_2NH$ ($K_b = 1.3 \times 10^{-3}$).	pH = 12.4
8	
8. Calculate $[OH^-]$, $[H^+]$, and the pH of 0.20 M solutions of each of the following amines: a. Triethylamine $[(C_2H_5)_3N, K_b = 4.0 \times 10^{-4}]$ b. Hydroxylamine $[HONH_2, K_b = 1.1 \times 10^{-8}]$	a) $[OH^{-1}] = 0.00894$ M $[H^{+1}] = 1.12 \times 10^{-12}$ M pH = 11.95 b) $[OH^{-1}] = 4.69 \times 10^{-5}$ M

	$[H^{+1}] = 2.13x10^{-10}$ M pH = 9.67
9 9. Codeine ($C_{18}H_{21}NO_3$) is a derivative of morphine. It was once commonly used in cough syrups but is now available only by prescription because of its addictive properties. If the pH of a 1.7×10^{-3} M solution of codeine is 9.59, calculate K_b.	$K_b = 9.11x10^{-7}$
10 10. A weak base, B, has a K_b of 4.46×10^{-10}. A solution with an unknown initial concentration is tested, and found to have a pH of 8.39. Determine the initial concentration of B.	[B] = 0.0135 M