CH 302 Spring 2007 Worksheet 6

1. You have a 750 mL solution of 0.1 M methylamine. You can't find the K_b for methylamine but notice that the K_a for its conjugate acid is 1×10^{-9}. What is the pH of the methylamine solution?

2. You decide to titrate the solution in problem 1 against 1 M hydrochloric acid. When you've added 25 mL of the HCl to the solution, what is the pH?

3. You continue the titration. What is the pH when you've added 75 mL HCl total? What is this point called?

4. You keep going until you've added 100 mL HCl. What is this final pH?

5. AgCl has a K_{sp} of 1.77×10^{-10}. What is the molar solubility of AgCl?

6. $Mg_3(PO_4)_2$ has a K_{sp} of 9.86×10^{-25}. What is the molar solubility of $Mg_3(PO_4)_2$?

7. Given the following compounds and K_{sp} values, rank the compounds from most to least soluble.

Compound	**K_{sp}**
ZnS	2.0×10^{-25}
Ag_2S	1.0×10^{-49}
$Fe(OH)_3$	6.3×10^{-38}
Fe_2S_3	1.4×10^{-88}

8. You drop 0.1 g of solid NaOH in an Olympic-sized swimming pool full of pure water (volume = 2.5×10^6 L). What is the pH of the pool?

9. What if you'd dropped 10 kg of NaOH into the pool?

10. List the assumptions that must be true for us to obtain reasonably accurate answers when using equations like $[H^+] = C_a$ or $[OH^-] = (K_bC_b)^{0.5}$.

11. Briefly explain the major reason that any of the above assumptions being false would invalidate our approximations.

12. You have a neutralization reaction, $OH^- + HA \leftrightarrow H_2O + A^-$. For the starting concentrations of OH^- and HA below, determine the concentrations of OH^-, HA, and A^- after neutralization.

   a. Initial: $[OH^-] = 0.1$ M $[HA] = 1$ M
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13-19. State whether the given mixture forms a buffer (hint: you may have to neutralize first). Whether it does or not, calculate the pH. K_a for HCOOH = 10^{-5}.

13. 1 M HCOOH and 1 M $COOH^-$

14. 1 M HCOOH and 1 M NaOH

15. 1 M HCOOH and 0.5 M NaOH

16. 1 M HCl and 1 M HCOOH

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20. Write down the five types of neutralization reactions (FROM MEMORY!!!!)

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