1.) 25.00 ml of a 0.1000 Molar methylamine (K_b = 4.4 x 10^{-4}) solution is placed in a beaker to be titrated against a 0.1000 M HCl solution.

(8) a.) Find the pH of the methylamine solution before any HCl is added.

(7) b.) Find the pH of the solution in the beaker after 10.00 ml of HCl was added.

(8) c.) Find the pH of the solution in the beaker after a total of 25.00 ml of HCl was added.

(4) d.) Find the pH of the solution in the beaker after a total of 25.20 ml of HCl was added.

(3) e.) Given the following approximate pK_in for the following indicators: thymol blue = 2.0, bromophenol blue = 3.8, methyl red = 5.2, bromothymol blue = 6.8, phenolphthalein = 9.5 Which indicator is the best one to use to detect the end point of the titration? _____________________________

(12) 2.) K_a of benzoic acid (HC_7H_5O_2) = 6.5 x 10^{-5}. 0.288 g of sodium benzoate
(NaC₇H₅O₂, Mw = 144) is added 10.0 ml of a 0.0500 M HCl solution. Find the pH of the resultant solution.

(10) 3.) Calculate the percent dissociation of a 0.0200 M benzoic acid solution. See $K_a$ in problem 2.

(12) 4.) Find $[H^+]$ and the pH of a 0.0200 M $H_2SO_4$ solution. $K_{a2}$ of $H_2SO_4$ solution = $1.2 \times 10^{-2}$. 
5a.) The $K_{sp}$ of lead chloride = $1.17 \times 10^{-5}$. Find the solubility of lead chloride in water in units of g/l. The molecular weight of PbCl$_2$ = 271.1

b.) Find the solubility of lead chloride in g/l in a solution that is 0.0500 M in CaCl$_2$.

6.) Show by calculation whether a precipitate will form on mixing 5.0 ml of 0.0400 M NaCl solution with 5.0 ml of a 0.0400 M Pb(NO$_3$)$_2$ solution.

7.) $K_f$ of Pb(OH)$_3$ = $8 \times 10^{13}$ and $K_{sp}$ of PbCl$_2$ = $1.17 \times 10^{-5}$. Find the equilibrium constant for the reaction: PbCl$_2$(s) + 3 OH$^-$$_{(aq)}$ $\rightarrow$ Pb(OH)$_3$$_{(aq)}$ + 2 Cl$^-$$_{(aq)}$. 