Acid-Base Equilibria and Solubility Equilibria

1. Calculate the pH at the equivalence point of formic acid (HCOOH) titration with NaOH, assuming both titrant and analyte concentrations are 0.10 *M*. The pK_a value for formic acid is 3.75.

2. Calculate the pH at the equivalence point in the titration of 30.0 mL of 0.25 *M* CH_3COOH with 0.25 *M* KOH. The K_a value of CH_3COOH is 1.8×10^{-5}.

3. Calculate the pH when of 30.0 mL of 0.25 *M* CH_3COOH is titrated with 10.0 mL 0.25 *M* KOH. The K_a value of CH_3COOH is 1.8×10^{-5}.

4. Calculate the K_{sp} value for bismuth sulfuide (Bi_2S_3), which has a solubility of 1.0×10^{-15} mol/L at 25°C.

5. Calculate the molar solubility of CaF_2 salt ($K_{sp} = 4.0 \times 10^{-11}$) in a 0.025 *M* NaF solution.

6. A solution is prepared by adding 750.0 mL of 4.00×10^{-3} *M* $Ce(NO_3)_3$ to 300.0 mL of 2.00×10^{-3} *M* KIO_3. Will $Ce(IO_3)_3$ solid ($K_{sp} = 1.9 \times 10^{-10}$) form from this solution?

7. Calculate the equilibrium concentrations of Pb^{2+} and I^- ions in a solution formed by mixing 100.0 mL of 0.0500 *M* $Pb(NO_3)_2$ and 200.0 mL of 0.100 *M* NaI solutions. The K_{sp} for PbI_2 is 1.4×10^{-8}.

8. Calculate the concentrations of Cd^{2+}, $Cd(CN)_4^{2-}$, and CN^- ions at equilibrium when 0.50 g of $Cd(NO_3)_2$ dissolves in 5.0×10^2 mL of 0.50 *M* NaCN. The K_f of formation for $Cd(CN)_4^{2-}$ ions is 7.1×10^{16} .