F_MT2

1. Given the following values of pK_a and pK_b, select the strongest acid from those listed below. [**HNO_2**]
   pK_a of HNO_2 = 3.37; pK_b of C_5H_5N = 8.75; pK_a of HBrO = 8.69; pK_b of NH_3 = 4.75; pK_a of HClO = 7.53;

2. What is the [OH^-] in a solution that has a pH of 12.50? [**3.2E-2**]

3. Give the conjugate base of HSO_4^-. Write it ignoring super and subscripts (so, HPO_4^{2-} would be HPO42-)? [**SO42-**]

4. Calculate the pH of a 0.50 *M* solution of ammonia (NH_3, $K_b = 1.8 \times 10^{-5}$). [**11.48**]

5. At a certain temperature, the percent dissociation (ionization) of chlorous acid, $HClO_2$, in a 1.63 *M* solution water is 10.0%. Calculate the value of K_a for chlorous acid at this temperature. [**1.63E-2**]

6. What is the pH of a solution prepared by mixing 50.00 mL of 0.10 *M* NH_3 with 25.00 mL of 0.10 *M* NH_4Cl? Assume that the volume of the solutions are additive and that $K_b = 1.8 \times 10^{-5}$ for NH_3. [**9.56**]

7. Calculate the pH when 0.68 g of C_6H_5COONa (FW = 144.1 g/mol) is added to 18 mL of 0.50 *M* benzoic acid, C_6H_5COOH (FW = 122.1 g/mol). Ignore any changes in volume. The K_a value for C_6H_5COOH is 6.5×10^{-5}. [**3.91**]

8. Calculate the pH of a solution prepared by adding 20.0 mL of 0.100 *M* HCl to 80.0 mL of a buffer that is comprised of 0.25 *M* NH_3 and 0.25 *M* NH_4Cl. K_b of $NH_3 = 1.8 \times 10^{-5}$. [**9.17**]

9. Determine the volume in mL of 0.781 *M* $KOH_{(aq)}$ needed to reach the half-equivalence (stoichiometric) point in the titration of 49.8 mL of 0.494 *M* $HClO_{(aq)}$. The K_a of HClO is 3.0×10^{-8}. [**1.57E1**]

10. Aniline ($C_6H_5NH_2$) has a $K_b = 3.8 \times 10^{-10}$. If 100.0 mL of a 0.5000 *M* aqueous aniline solution is mixed with 100.0 mL of 0.5000 *M* aqueous hydrochloric acid, the resulting solution will have a pH. [**<7**]

11. Calculate the pH of a 0.50 *M* solution of sodium acetate ($NaCH_3COO$). The K_a of acetic acid (CH_3COOH) is 1.8×10^{-5}. [**9.22**]

12. What is the pH of 0.422 *M* methylammonium bromide, CH_3NH_3Br? At 25°C, the K_b of CH_3NH_2 is 4.2×10^{-4}? [**5.50**]

13. At 25 °C the solubility of barium carbonate is 9.00×10^{-5} mol/L. Calculate the value of K_{sp} at this temperature. [**8.1E-9**]

14. The K_{sp} of AgCl at 25 °C is 1.6×10^{-10}. Consider a solution that is 1.0×10^{-9} *M* in $CaCl_2$ and 1.0×10^{-1} *M* in $AgNO_3$.[***Q* > K_{sp} and a precipitate will form**]

15. One liter of a saturated solution of CaF_2 contains 0.0167 g of dissolved CaF_2 (78.1 g/mol). What is the K_{sp} for CaF_2? [**3.91E-11**]

16. What is the solubility of CaF_2 (assume $K_{sp} = 4.0 \times 10^{-12}$) in 0.035 M NaF? [**3.3E-9**]

17. For which salt in each of the following groups will the solubility depend on pH? [**i) NaF; ii) $Ba(NO_2)_2$; iii) $Ca(OH)_2$; iv) $Fe(CN)_2$**]

    i) NaF, NaCl; ii) $Ba(NO_3)_2$, $Ba(NO_2)_2$; iii) $Ca(OH)_2$, $CaCl_2$; iv) $Fe(NO_3)_2$, $Fe(CN)_2$

18. The K_{sp} of Ag_2SO_4 is 1.2×10^{-5}. What is the solubility of Ag_2SO_4 (mol/L) in 0.25 *M* $AgNO_3$? [**1.92E-4**]

19. What is the pH of the resulting solution if 0.01944 mol of methylamine, CH_3NH_2, is added to 0.00351 mol of HCl in 60.0 mL of aqueous solution? Assume that the volume of the solution doesn't change.
    $CH_3NH_{2(aq)} + HCl_{(aq)} \rightarrow CH_3NH_3^+{}_{(aq)} + Cl^-{}_{(aq)}$. The dissociation of $CH_3NH_3^+$ has a $K_a = 2.70 \times 10^{-11}$, with reaction $CH_3NH_3^+{}_{(aq)} + H_2O_{(l)} \rightleftharpoons CH_3NH_{2(aq)} + H_3O^+{}_{(aq)}$. [**11.23**]

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