Acids and Bases

Math Tutor Practice

1. Formula equation: $CuSO_4(aq) + Na_2S(aq) \longrightarrow Na_2SO_4(aq) + CuS(s)$
   Full ionic equation: $Cu^{2+}(aq) + SO_4^{2-}(aq) + 2Na^+(aq) + S^{2-}(aq) \longrightarrow 2Na^+(aq) + SO_4^{2-}(aq) + CuS(s)$
   Net ionic equation: $Cu^{2+}(aq) + S^{2-}(aq) \longrightarrow CuS(s)$
2. Full ionic equation: $Cd^{2+}(aq) + 2Cl^-(aq) + 2Na^+(aq) + CO_3^{2-}(aq) \longrightarrow 2Na^+(aq) + 2Cl^-(aq) + CdCO_3(s)$
   Net ionic equation: $Cd^{2+}(aq) + CO_3^{2-}(aq) \longrightarrow CdCO_3(s)$

Acid-Base Titration and pH

Practice Problems A

1. $[H_3O^+] = 1 \times 10^{-4}$ M; $[OH^-] = 1 \times 10^{-10}$ M
2. $[H_3O^+] = 1.0 \times 10^{-3}$ M; $[OH^-] = 1.0 \times 10^{-11}$ M
3. $[H_3O^+] = 3.3 \times 10^{-13}$ M; $[OH^-] = 3.0 \times 10^{-2}$ M
4. $[H_3O^+] = 5.0 \times 10^{-11}$ M; $[OH^-] = 2.0 \times 10^{-4}$ M

Practice Problems B

1. **a.** pH = 3.0
   b. pH = 5.00
   c. pH = 10.0
   d. pH = 12.00

Practice Problems C

1. pH = 3.17
2. pH = 1.60
3. pH = 5.60
4. pH = 12.60

Practice Problems E

1. $[H_3O^+] = 1 \times 10^{-5}$ M
2. $[H_3O^+] = 1 \times 10^{-12}$ M
3. $[H_3O^+] = 3.2 \times 10^{-2}$ M; $[OH^-] = 3.2 \times 10^{-13}$ M
4. $[H_3O^+] = 2.1 \times 10^{-4}$ M

Practice Problems F

1. 0.157 M CH_3COOH
2. 0.0128 M H_2SO_4

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1. pH = 3.07
2. 8.9×10^{-5} M OH^-

Reaction Energy

Practice Problems A

1. 0.14 J/(g•K)
2. 329 K

Practice Problems B

1. –890.8 kJ
2. 2 kJ

Practice Problems C

1. –125.4 kJ
2. +66.4 kJ
3. –296.1 kJ

Practice Problems D

1. above 333 K

Math Tutor Practice

1. $\Delta H^0 = -396.0$ kJ
2. $\Delta H^0 = -441.8$ kJ

Reaction Kinetics

Practice Problems A

1. **a.** See figure below
   $\Delta E_{forward} = -150$ kJ/mol
   $\Delta E_{reverse} = +150$ kJ/mol
   $E_a = 100$ kJ/mol
   $E_a' = 250$ kJ/mol