HOUSEHOLD ACIDS AND BASES

1. What are the concentrations of H^+ and OH^- in pure water?

2. Calculate the pH of the following solutions and indicate whether the solution is acidic or basic.
   a) $[H^+] = 1 \times 10^{-2}$ mol/L
   b) $[OH^-] = 1 \times 10^{-2}$ mol/L
   c) $[OH^-] = 1 \times 10^{-8}$ mol/L
   d) $[H^+] = 1 \times 10^{-6}$ mol/L

3. What are the hydroxide ion concentrations for solutions that have the following pH values?
   a) pH = 4 b) pH = 8 c) pH = 12

4. Calculate the pH or $[H^+]$ for each solution.
   a) $[H^+] = 2.4 \times 10^{-6}$ mol/L
   b) $[H^+] = 9.1 \times 10^{-9}$ mol/L
   c) pH = 13.2
   d) pH = 6.7

5. Calculate the pH or $[OH^-]$ for each solution.
   a) $[OH^-] = 1.8 \times 10^{-2}$ mol/L
   b) $[OH^-] = 7.3 \times 10^{-9}$ mol/L
   c) pH = 4.6
   d) pH = 9.3

6. Classify each of these as an Arrhenius acid or Arrhenius base.
   a) $Ca(OH)_2$ d) C_2H_5COOH
   b) HNO_3 e) HBr
   c) KOH f) H_2SO_4

7. Identify each of the acids as mono, di or triprotic.

a) a) HNO_3 b) H_3PO_4 c) H_2SO_4 d) C_2H_5COOH

8. Write the three equations for the stepwise dissociation of phosphoric acid.

9. For each reaction identify the Bronsted-Lowry acid, Bronsted-Lowry base, conjugate acid and conjugate base.

a) $HNO_3 + H_2O \Leftrightarrow H_3O^+ + NO_3^-$

b) $CH_3COOH + H_2O \Leftrightarrow H_3O^+ + CH_3COO^-$

c) $NH_3 + H_2O \Leftrightarrow NH_4^+ + OH^-$

d) $H_2O + CH_3COO^- \Leftrightarrow CH_3COOH + OH^-$

10. Write the formula of the conjugate base of each of the following Bronsted-Lowry acids.

a) HCO_3^- b) HI c) NH_4^+ d) H_2SO_4

11. Write the formula of the conjugate acid of each of the following Bronsted-Lowry bases.

a) ClO_2^- b) $H_2PO_4^-$ c) H_2O d) NH_3

12. Is PCl_3 a Lewis acid or a Lewis base? Why?

13. Identify the Lewis acid and Lewis base in each reaction.

a) $H^+ + \ddot{O}(H)(H) \longrightarrow H_3O^+$

b) $AlCl_3 + Cl^- \longrightarrow AlCl_4^-$