Name _____
Period ___

Pre-Test #14 The Chemistry of Acids & Bases

Bronsted-Lowrey & pH

1. For the following aqueous equilibria, designate the Brønsted-Lowry conjugate acid-base pairs and circle the stronger base:
   a. $NH_3(aq) + H_2O(l) \rightleftharpoons NH_4^+(aq) + OH^-(aq)$

   b. $HCN(aq) + H_2O(l) \rightleftharpoons H_3O^+(aq) + CN^-(aq)$

   c. $NH_4^+(aq) + CO_3^{2-}(aq) \rightleftharpoons NH_3(aq) + HCO_3^-(aq)$
2. Write the name and formula for the conjugate bases of the following:
   a. HNO_2 c. HF
   b. H_2SO_4 d. $H_2PO_4^-$
3. Complete the Brønsted-Lowry equilibria, label the components acid or base, and pair up the conjugate acid-base pairs:
   a. $HSO_4^- + H_2O \rightleftharpoons$
   b. $NH_3 + H_2O \rightleftharpoons$
   c. $CN^- + H_2O \rightleftharpoons$
   d. $HClO_4 + H_2O \rightleftharpoons$-
4. Using the following Ka values, indicate the correct order of base strength. HCl: Ka very large, HNO_2: Ka= 4.0×10^{-4}, HF: Ka = 7.2×10^{-4}, HCN: Ka = 6.2×10^{-10}, H_2O: Kw = 1.0×10^{-14}
   a. $CN^- > NO_2^- > F^- > H_2O > Cl^-$ b. $Cl^- > H_2O > F^- > NO_2^- > CN^-$
   c. $CN^- > F^- > NO_2^- > Cl^- > H_2O$ d. $H_2O > CN^- > NO_2 > F^- > Cl^-$
5. Of the following acids, determine…(some are used more than once and others not at all)
   a. The strongest acid
   b. The acid that produces the lowest concentration of hydronium ions per mole of acid
   c. The acid with the strongest conjugate base
   d. The diprotic acid
   e. The 2nd strongest acid
   f. The acid with the weakest conjugate base

$HNO_3(aq) + H_2O(l) \rightleftharpoons H_3O^+(aq) + NO_3^-(aq)$	K_a = very large
$HSO_4^-(aq) + H_2O(l) \rightleftharpoons H_3O^+(aq) + SO_4^{2-}(aq)$	$K_a = 1.2 \times 10^{-2}$
$HCN(aq) + H_2O(l) \rightleftharpoons H_3O^+(aq) + CN^-(aq)$	$K_a = 4.0 \times 10^{-10}$
$H_2CO_3(aq) + H_2O(l) \rightleftharpoons H_3O^+(aq) + HCO_3^-(aq)$	$K_a = 4.2 \times 10^{-7}$
$NH_4^+(aq) + H_2O(l) \rightleftharpoons H_3O^+(aq) + NH_3(aq)$	$K_a = 5.6 \times 10^{-10}$
$HF(aq) + H_2O(l) \rightleftharpoons H_3O^+(aq) + F^-(aq)$	$K_a = 7.2 \times 10^{-4}$

6. The pKa of HOCl is 7.5. Calculate the pH of a 0.31 M solution of HOCl.
   a. 7.50 b. 6.50 c. 4.00 d. 10.00

7. Write net ionic for the complete neutralization of the acid-base reactions for:
   a. The reaction of acetic acid with aqueous ammonia solution
   b. The reaction of hydrofluoric acid with sodium hydroxide
   c. The reaction of ammonium chloride with potassium hydroxide
   d. The reaction of sodium bicarbonate with sulfuric acid
   e. The reaction of chlorous acid with aqueous ammonia solution

8. What is the pH of a solution that contains 2.60 grams of NaOH in 250 mL of aqueous solution?

9. A 0.12 M solution of an unknown weak acid has a pH of 4.26 at 25°C. What is the hydronium ion concentration in the solution and what is the value of its K_a?

10. Hydroxylamine (NH_2OH) is a weak base with a $K_b = 6.6 \times 10^{-9}$. What is the pH of a 0.36 M solution of hydroxylamine in water at 25°C?

11. Which of the following salts, when dissolved in water to produce 0.10 M solutions, would have the lowest pH?
   a. sodium acetate
   b. potassium chloride
   c. magnesium nitrate
   d. potassium cyanide
   e. sodium bisulfate

12. For each of the following salts, predict whether an aqueous solution would be acidic, basic, or neutral.
   a. sodium nitrate $NaNO_3$
   b. ammonium iodide NH_4I
   c. ammonium cyanide NH_4CN (NH_4^+ Ka $=5.6 \times 10^{-10}$, CN^- Kb $= 1.6 \times 10^{-5}$)
   d. sodium hypochlorite NaOCl

13. A solution of 8.01 M Formic acid (HCOOH) is 0.47% ionized. What is the Ka value of formic acid?
   a. 3.8×10^{-2} b. 1.8×10^{-4} c. 4.7×10^{-3} d. 3.8

14. Calculate the pOH of a 0.32 M solution of $Ba(OH)_2$
   a. 0.49 b. 0.19 c. 13.81 d. 13.51

15. Calculate the pH of a 0.35 M solution of potassium cyanide. K_a for HCN = 4.0×10^{-10}.

16. Calculate the pH of the following aqueous solution: 0.39 M NH_4Cl (pKb for $NH_3 = 4.74$)
   a. 9.17 b. 4.83 c. 9.67 d. 4.33