

Name _____

AP Chemistry

Chapter 14 HW 6: Due 11/22/16

Circle and write the letter of the correct answer on the line in front of each question.

Equilibrium Constant, K_a	
HA	4.8×10^{-8}

- C What is the $[H^+]$ of a 0.075 M solution of the acid HA?
 a. 6.1×10^{-4} M b. 2.2×10^{-4} M
 c. 6.0×10^{-5} M d. 4.8×10^{-8} M
- D Which salt produces the most alkaline solution at a concentration of 0.1 M?
 a. KNO_3 b. $MgCl_2$ c. NH_4Cl d. $NaNO_2$
- B The ionization of benzoic acid is represented by this equation.
 $C_6H_5COOH(aq) \rightleftharpoons H^+(aq) + C_6H_5COO^-(aq)$
 If a 0.045 M solution of benzoic acid has an $[H^+] = 1.7 \times 10^{-3}$, what is the K_a of benzoic acid?
 a. 7.7×10^{-5} b. 6.4×10^{-5} c. 3.8×10^{-2} d. 8.4×10^{-1}
- D $C_6H_5OH(aq) + CN^-(aq) \rightleftharpoons HCN(aq) + C_6H_5O^-(aq)$
 The equilibrium constant for this reaction is less than 1. What is the strongest base in this system?
 a. $C_6H_5OH(aq)$ b. $CN^-(aq)$ c. $HCN(aq)$ d. $C_6H_5O^-(aq)$
- A $HOCl(aq) \rightleftharpoons H^+(aq) + OCl^-(aq)$
 The ionization of hypochlorous acid represented above has $K = 3.0 \times 10^{-8}$ at $25^\circ C$. What is K for this reaction?
 $OCl^-(aq) + H_2O(l) \rightleftharpoons HOCl(aq) + OH^-(aq)$
 a. 3.3×10^{-7} b. 3.0×10^{-8} c. 3.0×10^6 d. 3.3×10^7
- A The dihydrogen phosphate ion undergoes these reactions in water.
 $H_2PO_4^-(aq) + H_2O(l) \rightleftharpoons HPO_4^{2-}(aq) + H_3O^+(aq)$ $K = 6.2 \times 10^{-8}$
 $H_2PO_4^-(aq) + H_2O(l) \rightleftharpoons H_3PO_4(aq) + OH^-(aq)$ $K = 1.6 \times 10^{-7}$
 What is the conjugate base of $H_2PO_4^-$?
 a. $HPO_4^{2-}(aq)$ b. $H_2O(l)$ c. $OH^-(aq)$ d. $H_3PO_4(aq)$
- B What is the pH of a 0.15 M solution of formic acid, $HCOOH$? $K_a HCOOH 1.9 \times 10^{-4}$
 a. 1.49 b. 2.27 c. 3.72 d. 4.55
- C Which salt gives the most acidic 0.1 M solution in water?
 a. $NaCl$ b. $NaNO_2$ c. NH_4Cl d. NH_4NO_2
- B What is the $[H^+]$ in a 0.10 M solution of ascorbic acid, $C_6H_8O_6$? $C_6H_8O_6$, $K_a = 8.0 \times 10^{-5}$
 a. 8.0×10^{-6} M b. 2.8×10^{-3} M c. 4.0×10^{-3} M d. 5.3×10^{-3} M
- D A 0.10 M solution of which salt is the most acidic?
 a. $NH_4C_2H_3O_2$ b. $NaCN$ c. KNO_3 d. $AlCl_3$
- B Acetylsalicylic acid (aspirin) behaves as an acid according to the equation shown. Calculate K_b for the $C_9H_7O_4^-(aq)$ ion. ($K_a = 3.0 \times 10^{-4}$)
 $HC_9H_7O_4(aq) + H_2O \rightleftharpoons H_3O^+(aq) + C_9H_7O_4^-(aq)$
 a. 3.0×10^{-17} b. 3.3×10^{-11} c. 9.0×10^{-8} d. 3.3×10^3
- B What is the pH of a 0.0015 M solution of HNO_3 ?
 a. 1.41 b. 2.82 c. 5.65 d. 11.18
- B In a solution of formic acid ($K_a = 1.7 \times 10^{-4}$), the $[H^+] = 2.3 \times 10^{-3}$. What is the concentration of formic acid in $mol L^{-1}$?
 a. 7.2×10^{-2} b. 3.1×10^{-2} c. 5.3×10^{-6} d. 3.9×10^{-7}
- C What is the $[H^+]$ in a solution in which $[HA] = 4.0 \times 10^{-2}$ and $[A^-] = 2.0 \times 10^{-2}$. [$K_a = 3.0 \times 10^{-6}$]
 a. 1.5×10^{-6} b. 3.0×10^{-6} c. 6.0×10^{-6} d. 3.8×10^{-3}
- A Which weak acid has the strongest conjugate base?
 a. acetic acid ($K_a = 1.8 \times 10^{-5}$) b. formic acid ($K_a = 1.8 \times 10^{-4}$)
 c. hydrofluoric acid ($K_a = 6.8 \times 10^{-4}$) d. propanoic acid ($K_a = 5.5 \times 10^{-5}$)

16. D What is the pH of a 0.20 M HA solution ($K_a = 1.0 \times 10^{-6}$) that contains 0.40 M NaA?
 a. 3.15 b. 3.35 c. 5.70 d. **6.30**
17. B A 0.1 M solution of which salt will have a pH less than 7?
 a. NaCl b. **NH_4Br** c. KF d. NaO_2CCH_3
18. D Which is the weakest acid?
 a. ascorbic acid ($K_a = 8.0 \times 10^{-5}$) b. boric acid ($K_a = 5.8 \times 10^{-10}$)
 c. butyric acid ($K_a = 1.5 \times 10^{-5}$) d. **hydrocyanic acid ($K_a = 4.9 \times 10^{-10}$)**
19. D At 20.0 °C water has $K_w = 6.807 \times 10^{-15}$. What is the pH of pure water at this temperature?
 a. 6.667 b. 6.920 c. 7.000 d. **7.084**
20. C Which solution has the highest pH?
 $\text{HCN}, K_a 5.8 \times 10^{-10}$ $\text{CH}_3\text{COOH}, K_a 1.8 \times 10^{-5}$
 a. 0.10 M CH_3COOH b. 0.10 M HCN c. **0.10 M CH_3COOK** d. 0.10 M NaBr
21. D What is the pH of a 0.025 M solution of KOH?
 a. 1.60 b. 3.69 c. 10.31 d. **12.40**
22. E Which of the following acids can be oxidized to form a stronger acid?
 a. H_3PO_4 b. HNO_3 c. H_2CO_3 d. H_3BO_3 e. **H_2SO_3**
23. D What is the pH of a 1.0×10^{-2} -molar solution of HCN? ($K_a = 4.0 \times 10^{-10}$)
 a. 10 b. Between 7 and 10 c. 7 d. **Between 4 and 7** e. 4
24. C At 25°C, aqueous solutions with a pH of 8 have a hydroxide ion concentration, $[\text{OH}^-]$, of...
 a. 1×10^{-14} M b. 1×10^{-8} M c. **1×10^{-6} M**
 d. 1M e. 8M
25. C $\text{H}_2\text{C}_2\text{O}_4 + 2 \text{H}_2\text{O} \rightleftharpoons 2 \text{H}_3\text{O}^+ + \text{C}_2\text{O}_4^{2-}$ Oxalic acid, $\text{H}_2\text{C}_2\text{O}_4$, is a diprotic acid with $K_1 = 5 \times 10^{-2}$ and $K_2 = 5 \times 10^{-5}$. Which of the following is equal to the equilibrium constant for the reaction represented above?
 a. 5×10^{-2} b. 5×10^{-5} c. **2.5×10^{-6}** d. 5×10^{-7} e. 2.5×10^{-8}
26. E If the acid dissociation constant, K_a , for an acid HA is 8×10^{-4} at 25 °C, what percent of the acid is dissociated in a 0.50-molar solution of HA at 25 °C?
 a. 0.08% b. 0.2% c. 1% d. 2% e. **4%**
27. B A 1-molar solution of which of the following salts has the highest pH?
 a. NaNO_3 b. **Na_2CO_3** c. NH_4Cl d. NaHSO_4 e. KBr
28. B Which, if any, of the following species is in the greatest concentration in a 0.100-molar solution of H_2SO_4 in water?
 a. H_2SO_4 molecules b. **H_3O^+ ions** c. HSO_4^- ions
 d. SO_4^{2-} ions e. All species have the same concentrations.
29. E As the number of oxygen atoms increases in any series of oxygen acids, such as HXO , HXO_2 , HXO_3 , ..., which of the following is generally true?
 a. The acid strength varies unpredictably.
 b. The acid strength decreases only if X is a nonmetal.
 c. The acid strength decreases only if X is a metal.
 d. The acid strength decreases whether X is a nonmetal or a metal.
 e. **The acid strength increases.**
30. C A 0.20-molar solution of a weak monoprotic acid, HA, has a pH of 3.00. The ionization constant of this acid is...
 a. 5.0×10^{-7} b. 2.0×10^{-7} c. **5.0×10^{-6}** d. 5.0×10^{-3} e. 2.0×10^{-3}