Chemistry 116 - Fall 2021

Dr. Audrey Dell Hammerich

Discussion Worksheet - Week 12

1. a) For which acid is CO_2 the acid anhydride?

   b) When CO_2 dissolves in water it forms the above acid. Write the equation for the ionization of this acid in water whose $K_{a1} = 4.4 \times 10^{-7}$.

   c) A carbonated drink has 0.10 M dissolved CO_2. What is the pH?

2. a) What is the strongest acid in water? Write its ionization in water and determine the value of its K_a.

   b) What is the strongest base in water? Write its ionization in water and determine the value of its K_b.

3. a) Write the equation for the reaction of NaH(s) with water.

   b) If 0.23 mol of NaH(s) were dissolved in enough water to form 2.8 L of solution, what is the pH? [12.91]

4. If the pH of a 0.15 M solution of a weak base is 10.50 what is its K_b? $[6.8 \times 10^{-7}]$

5. Sodium cyanide is the salt of the weak acid HCN ($K_a = 6.2 \times 10^{-10}$). Determine the concentration of H_3O^+, OH^-, HCN, and Na^+ in a 0.441 M solution of NaCN. $[OH^-] = 0.0027$ M

6. Arsenic acid (H_3AsO_4) is a triprotic acid.

   a) Write out its stepwise ionization in water and associate the proper K_a with each step. List the formulas of all Brønsted-Lowry acids appearing in your stepwise ionization from weakest to strongest.

   b) Write out the ionization in water of the conjugate base for each of the acids of part a) and associate the proper K_b with each step. List the formulas of all Brønsted-Lowry bases appearing from weakest to strongest.

   c) Associate each K_a with the proper K_b so that $K_a K_b = K_w$.

7. Give the concentration of all species present (H_3O^+, OH^-, H_2A, HA^-, and A^{2-}) in a 0.40 M solution of a diprotic acid (H_2A) with the two acid ionization constants of $K_{a1} = 5.9 \times 10^{-2}$ and $K_{a2} = 6.4 \times 10^{-5}$.

$[H_3O^+] = [HA^-] = 0.13$, $[H_2A] = 0.27$, $[OH^-] = 8.0 \times 10^{-14}$, $[A^{2-}] = 6.4 \times 10^{-5}$ M

8. Indicate whether each of the following will give rise to an acidic, basic, or neutral solution in water and provide a brief justification. You may want to consult Table 7-2 in the text.

a) $NaNO_3$

b) K_3PO_4

c) $FeCl_3$

d) $NaHCO_3$

e) NH_4F

9. Why doesn't water dissociate to produce 10^{-7} M H^+ and 10^{-7} M OH^- when some HBr is added?

10. What is the pH of 1.0×10^{-8} M KOH? [7.02]

11. a) Calculate the pH of 5.0×10^{-8} M $HClO_4$. [6.89]

b) What fraction of the total H^+ in this solution is derived from dissociation of water? [0.61]