In-Class Exercise VI - Acid/Base Chemistry

1. Identify the Brønsted-Lowry acid and Brønsted-Lowry base in each of the following neutralization reactions.

   a. $NaCN\,(aq) + HI\,(aq) \rightarrow NaI\,(aq) + HCN\,(aq)$

   b. $NH_3\,(aq) + H_2SO_4\,(aq) \rightarrow (NH_4)_2SO_4\,(aq)$

2. Identify the Arrhenius acid and Arrhenius base in each of the following neutralization reactions.

   a. $H_2C_2O_4\,(aq) + 2\,LiOH\,(aq) \rightarrow Li_2C_2O_4\,(aq) + 2\,H_2O\,(l)$

   b. $H_2SO_4\,(aq) + Mg(OH)_2\,(aq) \rightarrow MgSO_4\,(aq) + 2\,H_2O\,(l)$

   c. $HNO_3\,(aq) + KOH\,(aq) \rightarrow KNO_3\,(aq) + H_2O\,(l)$

3. Given the following balanced neutralization reaction, please circle all that are correct:

   $HBr\,(aq) + H_2PO_4^-\,(aq) \rightarrow H_3PO_4\,(aq) + Br^-\,(aq)$

   a. HBr (aq) is an Arrhenius acid and a Brønsted-Lowry acid.
   b. HBr (aq) is an Arrhenius base and a Brønsted-Lowry base.
   c. HBr (aq) is an Arrhenius acid but not a Brønsted-Lowry acid.
   d. HBr (aq) is a Brønsted-Lowry base but not an Arrhenius base.
   e. $H_2PO_4^-$ (aq) is an Arrhenius acid and a Brønsted-Lowry acid.
   f. $H_2PO_4^-$ (aq) is an Arrhenius base and a Brønsted-Lowry base.
   g. $H_2PO_4^-$ (aq) is an Arrhenius acid but not a Brønsted-Lowry acid.
   h. $H_2PO_4^-$ (aq) is a Brønsted-Lowry base but not an Arrhenius base.

4. Indicate whether the following solutions are strongly or weakly acidic or basic:

   a. egg white, pH = 7.9
   b. champagne, pH = 3.7
   c. lime juice, pH = 1.8
   d. tomato juice, pH = 4.1
   e. drain cleaner, pH = 13
   f. stomach acid, pH = 1
   g. seawater, pH = 8.2

5. Determine the pH for the following:
   a. $[H^+] = 0.00001$
   b. $[H^+] = 0.001$
   c. $[H^+] = 0.00000001$
   d. $[OH^-] = 0.00001$
   e. $[OH^-] = 0.001$
   f. $[OH^-] = 0.00000001$

6. Calculate the pH of eggs if the pOH is 6.2.
7. Calculate the pOH of peas if the pH is 7.6.
8. Calculate the pH of carrots if the pOH is 8.9.
9. Use your solubility rules to determine if the following compounds is a strong or weak electrolyte:
   a. NH_4Cl strong electrolyte weak electrolyte
   b. $Zn(OH)_2$ strong electrolyte weak electrolyte
   c. $BaCO_3$ strong electrolyte weak electrolyte
   d. K_2S strong electrolyte weak electrolyte
   e. $SrSO_4$ strong electrolyte weak electrolyte

10. If the titration of a 25.00 mL sample of hydrochloric acid requires 22.15 mL of 0.155 M sodium hydroxide, what is the molarity of the acid?

11. If the titration of a 35.75 mL sample of sulfuric acid requires 50.55 mL of 0.225 M potassium hydroxide, what is the molarity of the acid?