Che 111: Chapter 5 Practice Problems Key

1. Classify each of the following acids as **monoprotic**, **diprotic**, or **triprotic**.
   a. HCl(*aq*) (used in food processing) monoprotic
   b. H_2SO_4 (used in petroleum refining) diprotic
   c. $HC_2H_3O_2$ (solvent in the production of polyesters) monoprotic
   d. H_3PO_4 (catalyst for the production of ethanol) triprotic

2. Write the formulas of the acids that are derived from adding enough H+ ions to the following ions to neutralize their charge.
   a. SO_4^{2-} H_2SO_4
   b. NO_3^- HNO_3

3. Classify each of the following compounds as either
   (1) a binary ionic compound,
   (2) an ionic compound with polyatomic ion(s),
   (3) a binary covalent compound,
   (4) a binary acid, or
   (5) an oxyacid
   And write the **chemical formula** that corresponds to each name:
   a. potassium sulfide K_2S (1)
   b. copper(I) sulfate Cu_2SO_4 (2)
   c. sulfuric acid H_2SO_4 (5)
   d. hydrofluoric acid HF (4)
   e. ammonium nitrate NH_4NO_3 (2)
   f. sodium hydrogen carbonate $NaHCO_3$ (2)
   g. iodine pentafluoride IF_5 (3)

4. Classify each of the substances as a **weak acid**, **strong acid**, **weak base**, or **strong base** in the Arrhenius acid-base sense.
   a. HNO_3 Strong Acid
   b. H_2SO_4 Strong Acid
   c. Ammonia Weak Base
   d. nitrous acid Weak Acid
   e. LiOH Strong base
   f. $NaHCO_3$ Weak Base
   g. phosphoric acid Weak Acid

5. Classify each of the following solutions as **acidic**, **basic**, or **neutral**.
   a. Saliva with a pH of 7.0 neutral
   b. Beer with a pH of 4.712 acidic
   c. A solution of a drain cleaner with a pH of 14.0 basic

6. Write the complete equation for the neutralization reactions that take place when the following water solutions are mixed. (If an acid has more than one acidic hydrogen, assume that there is enough base to remove all of them. Assume that there is enough acid to neutralize all of the basic hydroxide ions.)

   a. ___ $LiOH(aq)$ + ___ $HNO_3(aq)$ → $LiNO_3 + H_2O$

   b. ___ $Co(OH)_2(s)$ + _2__ $HNO_3(aq)$ → $Co(NO_3)_2 + 2\ H_2O$

   c. ___ $H_3PO_4(aq)$ + _3__ $KOH(aq)$ → $3\ H_2O + K_3PO_4$

7. For each of the following equations, identify the Bronsted-Lowry acid and base for the forward reaction.

   a. $3NaOH(aq) + H_3PO_4(aq) \rightarrow 3H_2O(l) + Na_3PO_4(aq)$
      Base Acid

   b. $HS^-(aq) + HIO_3(aq) \rightarrow H_2S(aq) + IO^{3-}(aq)$
      Base Acid

   c. $HS^-(aq) + OH^-(aq) \rightarrow S^{2-}(aq) + H_2O(l)$
      Acid Base