WKS
Acid-Base Titrations

Name Key
Period ____ Date _____

1) What kind of a reaction is occurring during the titration of an acid and base?
A neutralization reaction (a special kind of double-replacement reaction).

2) What are the products of an acid-base titration?
A salt and water.

3) Write *balanced* neutralization equations for the following acid-base titrations:
   a) HNO_3 (nitric acid) and CsOH (cesium hydroxide)
   $HNO_3\ (aq) + CsOH\ (aq) \rightarrow CsNO_3\ (aq) + H_2O\ (l)$

   b) HBr (hydrobromic acid) and $Ca(OH)_2$ (calcium hydroxide)
   $2\ HBr\ (aq) + Ca(OH)_2\ (aq) \rightarrow CaBr_2\ (aq) + 2\ H_2O\ (l)$

   c) H_2SO_4 (sulfuric acid) and KOH (potassium hydroxide)
   $H_2SO_4\ (aq) + 2\ KOH\ (aq) \rightarrow K_2SO_4\ (aq) + 2\ H_2O\ (l)$

   d) $HC_2H_3O_2$ (acetic acid) and NH_4OH (ammonium hydroxide)
   $HC_2H_3O_2\ (aq) + NH_4OH\ (aq) \rightarrow NH_4C_2H_3O_2\ (aq) + H_2O\ (l)$

4) What quantity is being monitored in a titration? pH of the reaction mixture

5) What quantity is being measured in a titration? Volume of the titrating solution

6) What is an indicator? What is an indicator used for?
An indicator is an organic dye that changes color at a certain pH. It is used to show when the titration has finished.

7) Explain the following terms:
   a) Equivalence Point
   The pH in a titration when moles of H^+ = moles of OH^-.

   b) End Point
   The pH at which the indicator changes color to indicate that the titration is finished.

8) Determine the molarity of a LiOH solution if 25.0 mL of the solution is neutralized by 18.38 mL of 0.112 M HNO_3 solution. [Remember, find mol LiOH first, then divide by volume. The mole ratio is 1:1.]

$$?\ \text{mol LiOH} = 0.01838\ \text{L}\ HNO_3 \times \frac{0.112\ \text{mol}}{1\ \text{L}} \times \frac{1\ \text{mol LiOH}}{1\ \text{mol}\ HNO_3} = 0.00206\ \text{mol LiOH}$$

$$M_{LiOH} = \frac{0.00206\ \text{mol LiOH}}{0.0250\ \text{L}} = 0.0823\ \text{M}$$

9) Determine the molarity of an H_2SO_4 solution if 25.0 mL of the solution is neutralized by 48.13 mL of 0.187 M KOH solution. [See problem 3c for the balanced equation.]

$$?\ \text{mol}\ H_2SO_4 = 48.13\ \text{mL KOH} \times \frac{0.187\ \text{mol}}{1000\ \text{mL}} \times \frac{1\ \text{mol}\ H_2SO_4}{2\ \text{mol KOH}} = 0.00450\ \text{mol}\ H_2SO_4$$

$$M_{H_2SO_4} = \frac{0.00450\ \text{mol}\ H_2SO_4}{25.0\ \text{mL}} \times \frac{1000\ \text{mL}}{1\ \text{L}} = 0.180\ \text{M}$$