9.6 Titrations - Classwork

Directions: show all work and place a box around your answer (be sure to include units!)

1. Consider the following reaction.

    KOH + HCl → H_2O + HOH
    How many milliliters of 2.0M KOH are necessary to neutralize 50.0mL of 1.0M HCl?

2. How many milliliters of 0.20M H_2SO_4 are required to completely neutralize 40.mL of 0.10M $Ca(OH)_2$?

3. How many milliliters of 0.200M NaOH are needed to neutralize 100.mL of 0.100M HCl?

4. A 2.0mL sample of NaOH solution is exactly neutralized by 4.0mL of 3.0M HCl solution. What is the concentration of the NaOH solution?

5. A 10mL sample of hydrochloric acid neutralizes 15mL of a 0.40M solution of NaOH. What is the molarity of the hydrochloric acid?

6. In a laboratory activity, 0.500 mole of NaOH (s) is completely dissolved in distilled water to form 400. mililiters of NaOH(aq). This solution is then used to titrate a 300 mL solution of HNO_3(aq).

    a) Identify the negative ion produced when the NaOH(s) is dissolved in distilled water.

b) Calculate the molarity of NaOH(aq). Your response must include both a correct numerical setup and the calculated result.

c) Write a balanced neutralization reaction equation that takes place during this titration.

d) What is the concentration of the NHO_3(aq) solution?

7. Acid rain is a problem in industrialized countries around the world. Oxides of sulfur and nitrogen are formed when various fuels are burned. These oxides dissolve in atmospheric water droplets that fall to earth as acid rain or acid snow.

When normal rain has a pH between 5.0 and 6.0 due to the presence of dissolved carbon dioxide, acid rain often has a pH of 4.0 or lower. This level of acidity can damage trees and plants, leach minerals from the soil, and cause death of aquatic animals and plants.
If the pH of the soil is too low, then quicklime, CaO, can be added to the soil to increase the pH. Quicklime produces calcium hydroxide when it dissolves in water.
a) Write a balanced equation for the neutralization reaction that occurs between CaOH and HNO_3.

b) A sample of wet soil has a pH of 4.0. After the addition of quicklime, the H^+ ion concentration of the soil is 1/100 of the original H^+ ion concentration of the soil. What is the new pH of the soil sample?

c) Samples of acid rain are brought to a laboratory for analysis. Several titrations are performed and it is determined that a 20.0-mililiter sample of acid rain is neutralized with 6.50 mililiters of 0.010 M NaOH. What is the molarity of the H^+ ions in the acid rain?