Titration Problems

1. a) In a titration experiment, 28.50 mL of 0.50 mol dm^{-3} $H_2SO_{4(aq)}$ were required to neutralize 25.00 mL of $NaOH_{(aq)}$. What was the concentration of the $NaOH_{(aq)}$?
b) Write the non-ionic equation.
c) Write the total ionic equation.
d) Write the net ionic equation.

2. What volume of 0.350 mol L^{-1} KOH is required to neutralize:
a) 20.0 mL of 0.200 mol L^{-1} acetic acid, CH_3COOH
b) 20.0 mL of 0.200 mol L^{-1} phosphoric acid, H_3PO_4

3. Calculate the concentration of nitric acid $HNO_{3\,(aq)}$ if 20.00 mL of the acid is completely neutralized by 15.50 mL of 0.100 mol L^{-1} barium hydroxide.

4. Calculate the concentration of a $KOH_{(aq)}$ if 42.50 mL of this neutralizes 25.00 mL of 0.301 mol L^{-1} perchloric acid, $HClO_{4(aq)}$.

5. 0.20 g of oxalic acid, $H_2C_2O_4$ was neutralized with 35.50 mL of $NaOH_{(aq)}$. Determine the concentration of the $NaOH_{(aq)}$.

6. How many grams of calcium oxide will be able to dissolve in (i.e. react with) 35.50 mL of 0.25 mol L^{-1} nitric acid?

7. If 5.25 g of barium hydroxide, $Ba(OH)_{2(aq)}$, is able to be neutralized with 0.200 mol L^{-1} phosphoric acid, $H_3PO_{4(aq)}$, what volume of acid would be required for complete reaction?

8. A sample of 10.00 mL of ammonia solution is titrated with 20.50 mL of 0.145 mol L^{-1} $HCl_{(aq)}$. What is the concentration of the ammonia solution?

9. If 10.00 mL of $KOH_{(aq)}$ reacts with 0.955 g of oxalic acid, $H_2C_2O_4$, determine the concentration of the $KOH_{(aq)}$.

10. What mass of hydrogen chloride is dissolved in 500 mL of a hydrochloric acid, $HCL_{(aq)}$ solution, if 25.00 mL of this solution is neutralized by 20.00 mL of 0.67 mol L^{-1} $NaOH_{(aq)}$?

Answers: Titration Problems

1. a) 1.14 M
   b) $2NaOH_{(aq)} + H_2SO_{4(aq)} \rightarrow Na_2SO_{4(aq)} + 2H_2O_{(l)}$
   c) $2Na^+_{(aq)} + 2OH^-_{(aq)} + 2H^+_{(aq)} + SO_4^{2-}{}_{(aq)} \rightarrow 2Na^+_{(aq)} + SO_4^{2-}{}_{(aq)} + 2H_2O_{(l)}$
   d) $OH^-_{(aq)} + H^+ \rightarrow H_2O_{(l)}$

2. a) 0.0114 L
   b) 0.0343 L

3. 0.155 M
4. 0.0177 M
5. 0.125 M
6. 0.25 g
7. 0.102 L
8. 0.297 M
9. 2.12 M
10. Mass of HCl =