SAMPLE NEUTRALIZATION PROBLEMS

Using the balanced chemical equation:

$HCl + NaOH \rightarrow H_2O + NaCl$

The reaction uses one mole of sodium hydroxide for every one mole of hydrochloric acid. ….

YOU WILL USE THIS INFORMATION FOR "n" IN THE EQUATION BELOW:

nb * Ma * Va = na* Mb* Vb **(na / nb = # moles of acid/base from balanced equation)**

na = moles of acid na = 1 mole

nb = moles of base nb = 1 mole

Ma = Molarity of Acid Ma = 0.273 mol/L

Va = Volume of Acid Va = 25.00 mL (convert mL to "L")

Mb = Molarity of Base Mb = ???

Vb = Volume of Base Vb = 43.21 mL(convert mL to "L")

Solve the following neutralization problems:

1. What is the concentration of sodium hydroxide if it takes 43.21 mL of sodium hydroxide to neutralize 25.00 mL of 0.273 M hydrochloric acid? $HCl + NaOH \text{ ---> } H_2O + NaCl$

2. Calculate the volume of a 0.200 M KOH solution that is needed to neutralize 25.00 mL of a 0.115 M HCl solution. $KOH + HCl \text{ ---> } KCl + H_2O$

3. Calculate the volume of a 0.35 M H_3PO_4 solution that is needed to neutralize 100 mL of a 3.5 M $Mg(OH)_2$ solution. $3\ Mg(OH)_2 + 2\ H_3PO_4 \text{ ---> } Mg_3(PO_4)_2 + 6\ H_2O$

4. What is the concentration of aluminum hydroxide if it takes 21.21 mL of 3.0 M nitric acid to neutralize 40.00 mL of aluminum hydroxide

$3\ HNO_3 + Al(OH)_3 \text{ -----> } Al(NO_3)_3 + 3\ H_2O$

5. What is the concentration of hydrochloric acid if it takes 100 mL of a 3.5 M sodium oxide solution to neutralize 150.00 mL of hydrochloric acid?

$2\ HCl + Na_2O \text{-----> } 2\ NaCl + H_2O$

6. Find the volume of a 6M sulfuric acid solution needed to neutralize 1 liter of a 1.5 M aluminum hydroxide solution.

$3\ H_2SO_4 + 2\ Al(OH)_3 \text{-----> } Al_2(SO_4)_3 + 6\ H_2O$

7. Identify the acid, base, conjugate acid and base in the following:

$$HSO_3^-(aq) + H_2O(l) \rightleftarrows H_3O^+(aq) + SO_3^{2-}(aq)$$

$$NH_3(g) + H_2O(l) \rightleftarrows NH_4^+(aq) + OH^-(aq)$$

$HF(aq) + HSO_3^-(aq) \rightleftarrows F^-(aq) + H_2SO_3(aq)$

$HS^-(aq) + HNO_2(aq) \rightleftarrows NO_2^-(aq) + H_2S(aq)$