Titration Self-Check Questions

1. What is the approximate pH of a solution that is:
   a. yellow in methyl red, yellow in phenol red, and yellow in alizarin yellow?

   b. yellow in methyl red, red in phenol red, and red in alizarin yellow?

2. Write the general word equation for a neutralization reaction.

3. Write **balanced** neutralization reactions for the following:
   a. the reaction between acetic acid, $HC_2H_3O_2$ and potassium hydroxide, KOH

   b. the reaction between nitric acid, HNO_3 and calcium hydroxide, $Ca(OH)_2$

   c. the reaction between sulfuric acid, H_2SO_4, and sodium hydroxide, NaOH

4. If 25.00 mL of a 0.100 M NaOH solution is required to neutralize 15.00 mL of a solution of HCl, what is the molarity of the acid?

5. What is the concentration of a calcium hydroxide solution, $Ca(OH)_2$, if 30.00 mL of the base is completely neutralized by 10.0 mL of 0.0200 M HCl?

Answer Key

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1. What is the approximate pH of a solution that is:

   a. yellow in methyl red, yellow in phenol red, and yellow in alizarin yellow? **6.0 – 6.6**

   b. yellow in methyl red, red in phenol red, and red in alizarin yellow? **12 or higher**

2. Write the general word equation for a neutralization reaction.

   Acid + Base → Salt + Water

3. Write **balanced** neutralization reactions for the following:

   a. the reaction between acetic acid, $HC_2H_3O_2$ and potassium hydroxide, KOH

   $HC_2H_3O_2 + KOH \rightarrow KC_2H_3O_2 + H_2O$

   b. the reaction between nitric acid, HNO_3 and calcium hydroxide, $Ca(OH)_2$

   $2\ HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + 2\ H_2O$

   c. the reaction between sulfuric acid, H_2SO_4, and sodium hydroxide, NaOH

   $H_2SO_4 + 2\ NaOH \rightarrow Na_2SO_4 + 2\ H_2O$

4. If 25.00 mL of a 0.100 M NaOH solution is required to neutralize 15.00 mL of a solution of HCl, what is the molarity of the acid?

   The concentration of the HCl solution is 0.167 M.

5. What is the concentration of a calcium hydroxide solution, $Ca(OH)_2$, if 30.00 mL of the base is completely neutralized by 10.0 mL of 0.0200 M HCl?

   The concentration of the $Ca(OH)_2$ solution is 3.33×10^{-3} M.