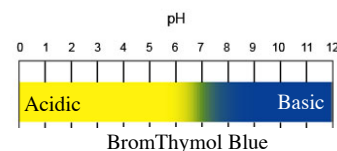


# LAD H2 (pg 1 of 2) Acid Base Reaction aka Neutralization

Name \_\_\_\_\_ Per \_\_\_\_\_

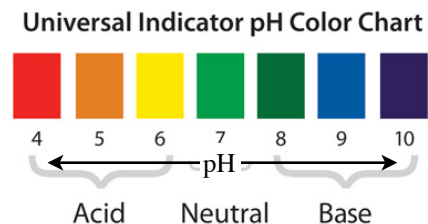


1. Consider the reaction between strong hydrochloric acid solution and strong sodium hydroxide solution with BTB indicator to show acidic and basic.

- a. Write the balanced overall equation.
- b. Write the net ionic equation.
- c. Calculate the number of moles of  $H^+$  in 500 ml of 2.0 M HCl (*How warm or cold is the acid sol'n.*)
- d. Calculate the number of moles of  $OH^-$  in 500 ml of 2.0 M NaOH (*How warm or cold is the base sol'n.*)
- e. Calculate the number of moles of water formed during the reaction. (*Feel the temperature of the neutralized sol'n.*)

2. Consider the reaction between *weak* acetic acid and strong sodium hydroxide with universal indicator to show acidic and basic.

- a. Write the balanced overall equation.

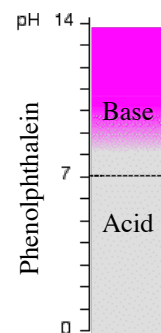


- b. Write the net ionic equation.

3. Consider the reaction between a *suspension* of magnesium hydroxide and strong hydrochloric acid. (*Test the temp before and after.*) with phenolphthalein indicator to show acidic and basic

- a. Write the balanced overall equation.

- b. Write the net ionic equation. *Eliminate the spectator ions.*



- c. Each teaspoon of Milk of Magnesia contains 400 mg of magnesium hydroxide. Calculate the volume of 1.2 M hydrochloric acid required to neutralize this amount of milk of magnesia in the typical dose of 3 teaspoons. Each teaspoon is 5.0 ml.

4. Strong nitric acid can be neutralized by reacting with strong potassium hydroxide.

(a) Write the balanced overall equation between strong nitric acid and strong potassium hydroxide.

(b) Write the balanced net ionic equation between strong nitric acid and strong potassium hydroxide.

5. From the equation above, you can see that an equal number of moles of potassium hydroxide is required to neutralize a particular amount of moles of nitric acid. This will allow us to use the dilution equation to compute the concentration of nitric acid that is neutralized by a known concentration of potassium hydroxide.

$$M_b V_b = M_a V_a$$

Instead of measuring volume with a graduated cylinder, we will measure volume by drops making the assumption that the volume of a drop from the plastic pipet is consistent enough. Use a different indicator; phenolphthalein, bromothymol blue, or universal indicator for each of your trials.

6. Your task is to determine the molarity of the yellow acid and green base by testing with the blue base and pink acid. The blue base and the pink acid are each 0.10 M. Collect data in the last column in the tables below. Make the appropriate calculations and fill in the concentration in the first column for the yellow acid and green base. Show the set up for your calculation for only trial 2 for both the yellow acid and green base in the space below their tables.

|         | concentration of yellow acid (M) | volume of yellow acid (drops) | concentration of blue base (M) | volume of blue base (drops) |
|---------|----------------------------------|-------------------------------|--------------------------------|-----------------------------|
| trial 1 |                                  | 5                             | 0.1                            |                             |
| trial 2 |                                  | 8                             | 0.1                            |                             |
| trial 3 |                                  | 12                            | 0.1                            |                             |
|         |                                  |                               |                                |                             |

|         | concentration of green base (M) | volume of green base (drops) | concentration of pink acid (M) | volume of pink acid (drops) |
|---------|---------------------------------|------------------------------|--------------------------------|-----------------------------|
| trial 1 |                                 | 12                           | 0.1                            |                             |
| trial 2 |                                 | 15                           | 0.1                            |                             |
| trial 3 |                                 | 18                           | 0.1                            |                             |
|         |                                 |                              |                                |                             |