Experiment 18, Acid-Base Indicators

Name _____ Per ___

Purpose: To prepare acid-base indicator solutions, note the colors at different concentrations, and use them to find the concentration of unknown acids and bases.

Procedure: We shall divide the work into two groups-- **Tables A** and **Tables B**. The instructor will assign the tables. Tables A will do the Acids, and Tables B will do the bases. Then the results will be shared. ***Do not dump your indicator sets until all are done as yours will be needed by the other tables.***

Part I.

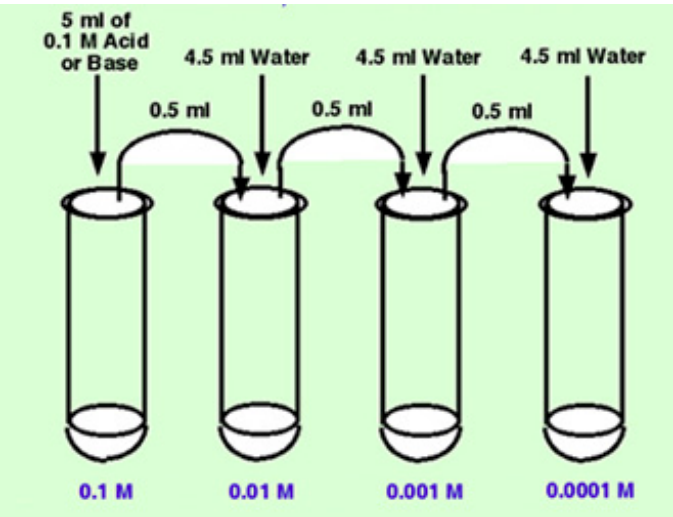
TABLES A: Preparation of Standard Solutions in the **Acid Range: Use the 0.1 M HCl.**

TABLES B: Preparation of Standard Solutions in the **Basic Range: Use the 0.1 M NaOH.**

a. Obtain 5.0 ml of 0.1 acid or base, according to the above tables, and place it into a 13 X 150 mm test tube. Label this tube 0.1 M.

b. Dilute this solution ten times by taking 0.5 ml (10 drops) of it and adding it to a second test tube labeled 0.01 M and adding 4.5 ml of distilled water. See Figure 18-1 below.

c. Dilute the solution twice more as shown in Figure 18-1 below. Label the test tubes as shown in Fig 18-1 below.



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d. Prepare a second set by pouring one-half of the contents of each of the above tubes into another set of tubes labeled as above. We shall now have two sets of standard solutions of concentrations 0.1 M, 0.01 M, 0.001 M and 0.0001 M acid or base.

e. for **TABLES A**: To one of your sets of **Acid** solutions, add two drops of **Orange IV** indicator to each of the four test tubes. To the other set of your solutions, add two drops of **Methyl Orange** indicator. On the back, make a table for recording the colors observed in each of the solutions' **$[H^+]$** .

f. for **TABLES B**: To one of your sets of **Base** solutions, add two drops of **Indigo Carmine** indicator to each of the four test tubes. To the other set of your solutions, add two drops of **Alizarin Yellow R** indicator. On the back, make a table for recording the colors observed in each of the solutions' **[OH^-]** .

Part II: The Determination of the Concentrations of Unknown acids and bases using the Indicator Solutions prepared above. We shall test **four unknowns** as follows:

a. With a graduate, carefully measure 6.0 ml of one of the unknown solutions. Test it with litmus paper by touching a stirring rod moistened with the sample to the paper. Do not throw the papers away, the instructor recycles them. Remember that litmus is ***Red in Acid*** and ***Blue in Base***.

b. **(Acid)** Divide the sample into two test tubes. If the samples are **Acidic**, add two drops of **Orange IV** to one tube and two drops of **Methyl Orange** to the other tube.

c. **(Base)** Divide the sample into two test tubes. If the samples are **Basic**, add two drops of **Indigo Carmine** to one tube and two drops of **Alizarin Yellow R** to the other tube.

d. Compare the colors of your samples with those of the standards prepared by either you or other tables. Use these comparisons to determine the concentration of the acid or base in **M**.

e. Repeat Part II a & b with each of the other Unknown Samples. List the concentrations in this data table:

Sample Number	Acid or Base	Concentration
.	.	M
.	.	M
.	.	M
.	.	M

Part III: Finding the **[H^+]** in a solution of a weak acid. A weak acid is not completely ionized and therefore its **pH** will be less than that determined by the molar concentration. Acetic acid is a weak acid.

a. for **TABLES A**: Obtain 6.0 ml of **0.1 M Acetic Acid**, CH_3COOH in a graduate. Divide this into two test tubes. Add two drops of **Orange IV** in one and two drops of **Methyl Orange** into the other. Compare to your standards and estimate the **[H^+]** in **M**. Compare this to the molarity of the stock solution. Explain:

b. for **TABLES B**: Obtain 6.0 ml of **1.0 M Acetic Acid**, CH_3COOH in a graduate. Divide this into two test tubes. Add two drops of **Orange IV** in one and two drops of **Methyl Orange** into the other. Compare to your standards and estimate the **[H^+]** in **M**. Compare this to the molarity of the stock solution. Explain on back:

c. Exchange results with the other tables and compare:

Write a Critique for this Lab: