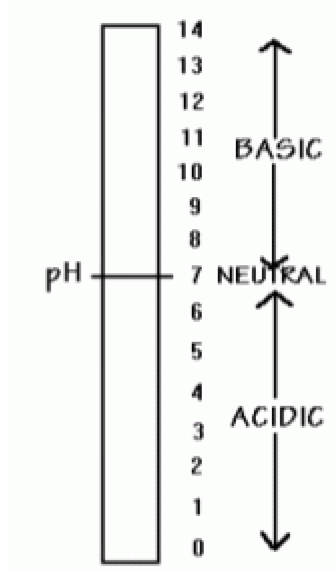
pH OF HOUSEHOLD PRODUCTS

Reminder – Goggles must be worn at all times in the lab!

PRE-LAB DISCUSSION:

Water is an interesting substance. Pure distilled water disassociates ("breaks") into protons (H^+) and hydroxide ions (OH^-) of equal number. If the concentration of H^+ is greater than the OH^- concentration, the solution is acidic. If the H^+ concentration is less, the solution is considered alkaline. Equal numbers of OH^- ions and H^+ ions in a solution make the solution "neutral."



Everyone who uses the term pH has an idea that it has to do with the degree of acidity. Not all realize that a change of one pH number is a change of the H^+ ion concentration by a factor of 10. That is: A pH of 5 has 10 times the H^+ ion concentration of a pH of 6. In a like manner a pH value of 7, although it represents neutrality is 1000 times as acidic as a pH of 10.

The pH scale, then, is a logarithmic scale. Each pH number differs from the next by a factor of 10. The neutral position is 7 on a 0 through 14 scale. The numbers 0 to 7 indicate the acid range, and the numbers above 7 to 14 represent the alkaline range. Keep in mind that by the use of a logarithmic scale, a unit change in pH corresponds to a tenfold change in ion concentrations.

Then, what is pH? pH is a short hand way of accounting for the available protons (H^+) in a solution. In a like manner, there exists a related pOH to do the same for the available hydroxide (OH^-) ions. The relationship between H^+ and OH^- ions is shown in two ways.

A. $H^+ + OH^- = H_20$
B. The number of H^+ times the number of OH^- ions equals a constant number at a given temperature, pressure and volume of water.

At 25°C and one atmosphere of pressure the number of H^+ times the number of OH^- ions equals .00000000000001 or 1×10^{-14}. The number 1×10^{-14} represents a constant relationship between $[H^+]$ and $[OH^-]$. Because the pH scale is logarithmic, pH + pOH = 14. Why is pH important? Seventy-five percent of the earth's surface is best operated at a pH of 8 to 8.3. Your own blood must also have a constant pH. Organisms are subject to considerable change if there are changes in the acidity (or alkalinity) of their waters.

PURPOSE:

To learn the proper use of a reliable pH indicator by testing and determining a number of household solutions.

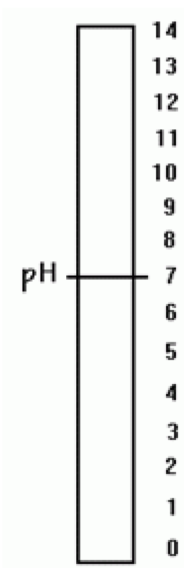
PROCEDURE:

Determining the pH of solutions.

1. Obtain a clean, dry spot plate from your lab drawer. It is crucial that the wells be clean and dry – contamination could significantly alter your results.
2. Place samples of the solutions to be tested, in wells, away from one another. Be certain to place enough solution in the wells to make testing possible, but not so much as to overflow the well and contaminate other solutions. It is suggested that you place the spot plate on a piece of paper, and label the paper in order to distinguish one solution from another.
3. Use a glass stir rod to transfer a small amount of each solution to small pieces of pH paper resting on a glass plate from your lab drawer. Remember that you do not need a whole piece of pH paper for each test – tear them into halves or even into thirds. Be certain to clean the stir rod between tests. Record your observations in the Data section.

RESULTS:

SAMPLE	pH
1)	
2)	
3)	
4)	
5)	
6)	
7)	
8)	
9)	
10)	
11)	
12)	



On your lab paper, draw the scale shown at the left. Draw it so that it extends nearly the entire length of the paper. Use the lines on your binder paper to create the scale of pH values from 0 to 14, including the number along the line.

Now, plot each of the solutions that you tested along the graph according to its pH.