Measurement of pH in the Biochemistry and Food Industries

The pH of food can be measured with the use of color indicators or electrochemically. In acid-base titration, indicators are used which change color at around pH 9.0. The pH values of foodstuffs which are not too highly colored can be readily determined by the use of pH indicator papers. These are now available in wide and narrow ranges of pH, enabling values to be measured within 0.5 or less units of pH.

Electrochemical measurements using pH meters are now simple and accurate. Micro-electronic components have made possible small portable high quality instruments with digital displays, some with built-in electrodes. These meters measure the potential difference between a glass electrode and a standard calomel electrode or silver/silver chloride electrode and are calibrated by the use of prepared or purchased buffer solutions of accurately known pH. There are also available other types of electrodes designed for special purposes, such as probe electrodes for the examination of carcass meat. Very accurate pH measurement, through seldom required in food analysis, is very susceptible to the temperature of the test solution. Temperature compensation devices are incorporated in pH meters to correct for known temperature deviations.

Some of the pH values of a number of biological materials are given below:

Material	pH value
Blood, normal limits	7.3 - 7.5
Blood, extreme limits	7.0 - 7.8
Enzymes, activity range of	
Amylopsin, optimum	7.0
Erepsin, optimum	7.8
Invertase, optimum	5.5
Lipase, optimum	7.0 - 8.0
Maltase, optimum	6.1 - 6.8
Pepsin, optimum	1.5 - 2.4
Trypsin, optimum	8.0 - 9.0
Fruit Juices	
Apple	3.8
Banana	4.6
Grapefruit	3.0 - 3.3
Orange	3.1 -4.1
Tomato	4.2
Gastric juice (adult)	0.9 - 1.6
Milk (cows)	6.2 - 7.3
Plants (extracted juice)	
Alfalfa tops	5.9
Carrot	5.2
Cucumber	5.2
Peas, field	6.8
Potato	6.1
Rhubarb, stalks	3.4
String beans	5.2
Sweat	4.5 - 7.1
Saliva	6.2 - 7.6
Urine (human)	4.2 - 8.0
Tears	7.2

Table A - pH Values of Representative Biological Materials, Elements of Food Biochemistry, William H. Peterson, Ph.D., John T. Skinner,