pH Measurement

pH measurement is used in a wide variety of applications: agriculture, wastewater treatment, industrial processes, environmental monitoring, and in research and development. pH is a measure of the acidity or alkalinity of a solution. The pH value states the relative quantity of hydrogen ions (H +) contained in a solution. The greater the concentration of H + the more acidic the solution and the lower the pH. In this relationship, pH is defined as the negative logarithm of hydrogen activity. A standard pH measuring system consists of three elements: 1) pH electrode; 2) temperature compensation element and 3) pH meter or controller.

Finding the value for pH is essential in determining an important characteristic of a solution.

So, pH is just a unit to represent one characteristic of a solution, just as the meter is a unit of length. Measuring pH is also as the first step toward managing chemical reactions. Currently, pH measurement is used in various fields, including nearly all industries that deal with water, not only the chemical industry, but public organizations, agriculture and fishery-related industries and biological industries, as well.

pH Values of Common Substances

BASIC

pH - 14 - household lye
pH - 12.8 - bleach
pH - 11.3 - ammonia
pH - 8.5 - baking soda
pH - 7.5 - pool water

NEUTRAL

pH - 7.0 - distilled water

ACIDIC

pH - 5.8 - rain water
pH - 4.5 - orange juice
pH - 3.0 - vinegar
pH - 2.5 - Coca-Cola™n2.0 - lemon juice
pH - 0.5 - battery acid

pH - Significant Levels

pH - CDWG: 6.5 - 8.5
pH - CCME Freshwater Aquatic Life: 6.5 - 9.0
pH - 3.0 - 3.5 Fish survive only hours
pH - 4.0 - 4.5 All fish, most frogs, and insects absent
pH - 6.5 - 8.2 Optimal for most organisms
pH - 9.0 - 10.5 Harmful to salmonids and perch
pH - 10.5 - 11.0 Lethal to salmonids
pH - 11.0 - 11.5 Rapidly lethal to all species of fish

Electrode Conditioning

1 . Remove the protective cap from the bottom of the sensor, and rinse the electrode with distilled or deionized water.

2. Place the electrode in a beaker of one of the following liquids for one hour to rehydrate the electrode. The liquids listed below are in the order of their ionic ability to condition the electrode.
    A. KCl (potassium chloride) 3.8 or 4.0 molar
    B. Tap water
    C. 4.0 pH buffer
    D. 7.0 pH buffer

NOTE: Never condition a pH electrode in distilled or deionized water. Long term exposure of the glass electrode to pure water will damage the glass by leaching pH sensitive elements out of the glass.

3. After one hour of conditioning the sensor, rinse the electrode with distilled or deionized water. You are now ready to calibrate with buffers and take measurements.

Electrode Storage

1 . Once measurements have been made, the electrode should be stored in a manner which will keep the bulb of the electrode moist or hydrated.
    A. The protective cap of the electrode can be used to hold a small amount of liquid. Add a few drops of potassium chloride or 4.0 pH buffer to the cap or rubber boot, then place the cap on to the electrode. This method works for long and short term storage.
    B. The electrode can be placed in a beaker of either potassium chloride, 4.01 pH buffer, 7.00 pH buffer or tap water for short term storage.
    C For pHTestrs, place a small piece of sponge or paper towel in the bottom of the cap. Wet the sponge or paper towel with potassium chloride, tap water or pH 4.0 buffer and replace the cap.

Solutions which cannot be measured with General Purpose Electrodes: Heavy Metals, Proteins, Organics, Low Ion Solutions (Dl water), High Sodium, Sulfides, Tris Buffers

If a sample contains any of these contaminants, the pH electrode may work for only a very short period of time before it fails to operate at all. Reconditioning may restore the electrode to a useful condition but the same short term usage may occur if it is to be used in the same sample again. If a sample contains any of these contaminants, the customer should look at other electrode combinations which are more compatible with the solutions to be measured.