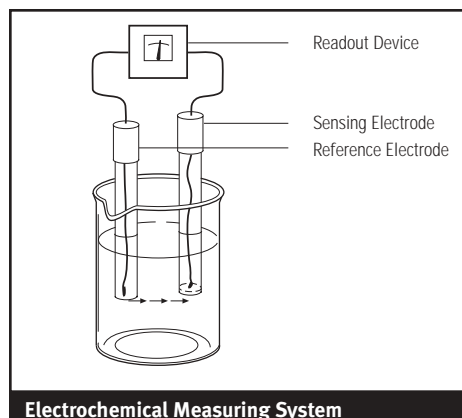


Orion pH, ORP and ISE Theory



How pH, ORP and ISE Measurements are Made

One of the many advantages of electrode technology is the variety of analytical methods available to the user. The choice of method depends on:

- Desired Speed and Accuracy Required
- Range of Sample pH or Concentrations
- Sample Type (Dry or Aqueous)
- Available Instrumentation
- Field or Lab Measurement

Essential Components

Regardless of sample conditions, the essential components of a pH or ion selective measuring system are:

- A Sensing Electrode and Reference Electrode (Half-Cell System) or a Sensing Electrode with Built-in Reference (Combination System)
- A Readout Device (Meter)
- A Solution Containing the Ion to be Measured

Sensing Electrode

When a sensing electrode comes in contact with a sample containing ions which it has a sensing membrane for, an electrical potential develops across the membrane surface. The magnitude of the potential relates to the concentration of the ion being measured, so that the higher the potential, the higher the concentration.

Reference Electrode

To make a measurement, a second unvarying electrical potential is needed to compare the sensing membrane potential with. The reference electrode provides this function. A filling solution within the reference electrode completes the electrical circuit between the sample and internal cell of the reference electrode. The point of contact between the sample and filling solution is called the liquid junction.

Combination Electrode

Many sensing electrodes have the reference electrode built into the same electrode body. These electrodes are referred to as combination electrodes. Combination electrodes provide the same selectivity and response as a half-cell system, but offer the convenience of working and maintaining only one electrode. In many cases, a combination electrode provides an optimized system for one sensing membrane.

Readout Device

A meter (potentiometer or voltmeter) serves as the readout device to display the difference between the reference electrode and sensing electrode potentials in millivolts, pH or concentration units.

Sample

The sample or standard solution is the final component of the system. The nature of the sample determines which measurement techniques are appropriate for the analysis.