



Parameter

pH

Sample Type

Surface Water

Introduction

The pH of surface water is a common field measurement. This measurement can be made using a ROSS Ultra Triode which will measure both the temperature and pH of the sample with a single probe. The probe provides quick, reproducible results in both fresh and salt water samples.

Reference

USGS National Field Manual: pH Method, Chapter 6.4; Version 1.3, January 2006.

Result Statistics

See page 2

Recommended Equipment

Orion 3-Star Plus Portable pH Meter (Orion 1212000); ROSS Ultra Triode (Orion 8157BNUWP); Optional: NIST calibrated thermometer

Required Solutions

pH 4.01, 7.00, and 10.01 Buffer Pouches (Orion 910425, 910725 and 911025); Filling Solution (Orion 810007); deionized water (DI); ROSS storage solution (810001).

Solutions Preparation

Buffers used for field calibration should be equilibrated to the temperature of the sample. This can be done by placing buffer pouches in large beaker of sample for 10 minutes prior to calibration.

Meter Setup

Connect the electrode to the Star Meter. Set measurement mode to pH. In Setup mode of Star Meter, set resolution to 0.01, Buffer Set to USA and read type to Auto. If all steps were followed correctly the meter display will show a number with two decimal places in the top line and "pH" to the right of the top line. The temperature will also be displayed in the top left of the screen.

Electrode Setup

See the electrode manual for preparation of the electrode.

Electrode Performance Check

These checks may be done in the lab. Check slope at least daily according to the electrode manual. Drift may be checked by comparing a 1-minute to 2-minute reading. Results should agree with desired criteria. See troubleshooting section of manual if slope and/or drift are not acceptable. Be sure electrode is working properly before going out into the field to make measurements.

Electrode Storage, Soaking, and Rinsing

Store electrode in pH 4.01 or 7.00 buffer in between measurements. A buffer pouch in a beaker of sample is best to keep the electrodes as close to sample temperature as possible. Rinse the electrode with DI water and blot dry with lint free tissue before measuring the next sample. Store electrode in small bottle with electrode storage solution when transporting probe.

Sample Preservation

None required.

Sample Preparation

Sample is measured in the field; no preparation required.

Calibration

Calibrate the probe's thermistor against a NIST calibrated thermometer if desired. Calibrate pH sensor in the field. Buffers must equilibrate with sample temperature before calibration. Place pouches in a large beaker containing sample water for at least 10 minutes to allow for temperature of buffer to equilibrate. Perform a three point calibration using pH 4.01, 7.00 and 10.01 buffers. The meter automatically recognizes the buffers and displays the temperature-corrected pH value for each calibration point. The electrode slope should be between 92 and 102%. Read a fresh portion of pH 7.00 buffer to verify calibration. Reading will be temperature-adjusted, see table on page 2 for expected values. If readings are not acceptable and/or slope is not within range, see troubleshooting section of manual.

Analysis

Rinse electrode with DI water and blot dry. Collect a sample aliquot in a large beaker. Place probe in beaker and measure immediately following collection. The pH value will be displayed. When a stable reading is achieved, the "pH" icon will stop flashing and screen will freeze with stable values displayed. Read additional aliquots until successive sample readings are within 0.1 pH unit of each other.

Quality Control (QC)

Recommended QC procedures include: calibration and calibration verification, sample duplicates, slope, and drift.



Lake (public water supply)	pH	Temperature (°C)
Sample 1	7.64	26.6
Sample 2	7.56	26.8
Sample 3	7.60	26.8
Mean	7.60	26.7
Standard Deviation	0.04	0.12
Time per sample	121 seconds	

Mill Pond	pH	Temperature (°C)
Sample 1	7.85	25.2
Sample 2	7.71	25.1
Sample 3	7.78	24.9
Mean	7.78	25.1
Standard Deviation	0.07	0.15
Time per sample	85 seconds	

Ocean (Harbor)	pH	Temperature (°C)
Sample 1	8.12	20.2
Sample 2	8.15	20.2
Sample 3	8.12	20.0
Mean	8.13	20.1
Standard Deviation	0.02	0.12
Time per sample	33 seconds	

Temperature Corrected Values for pH 7.00 buffer

°C	0	10	20	30	40	50	60	70	80	90
pH	7.11	7.06	7.01	6.98	6.97	6.97	6.97	6.99	7.03	7.08

For a more detailed table (including buffers 4.01 and 10.01), see
http://www.thermo.com/com/cda/resources/resources_detail/1,2166,13217,00.html