

STANDARD OPERATING PROCEDURE
Instructions for the Calibration and Use of the PCSTestr35 pH Meter for Groundwater Sampling

KEY WORDS

pH, pH meter, calibration, groundwater, sampling

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1.0 INTRODUCTION

1.1 Purpose

The term pH is defined as the measure of how acidic or basic a solution is based on the relative amount of free hydrogen (H⁺) and free hydroxyl ions (OH⁻). The equation for pH is:

$$pH = -\log_{10}[H^+]$$

A value of 7 represents a neutral pH and is the absolute value of the ion product of water at 25°C. Lower values of pH indicate increasing acidity (more free H⁺), and higher numbers indicate increasing alkalinity (more free OH⁻). For groundwater studies, the pH of water can affect pesticide transformation rates and pathways; this can be direct, by changing reactant concentrations, or indirect by affecting organisms and surfaces involved in pesticide reactions (Barbash & Resek 1996).

1.2 Scope

This document provides instructions for calibrating and using a PCSTestr35 pH meter for groundwater sampling. PCSTestr35 pH meters need to be calibrated before each sampling trip. The pH is measured at each groundwater sampling site.

2.0 MATERIALS

Materials needed are listed below and shown in **Figure 1**:

- 2.1 Portable PCSTestr35 pH meter
- 2.2 Instruction manual for PCSTestr35 pH meter
- 2.3 Extra batteries
- 2.4 Buffer solutions: at pH 7.0, 4.0, and 10.0.
- 2.5 Two 50 mL or 100 mL Beakers
- 2.6 Deionized (DI) water in a squirt bottle
- 2.7 A single half-pint glass jar
- 2.8 Laboratory wipes
- 2.9 Nitrile gloves

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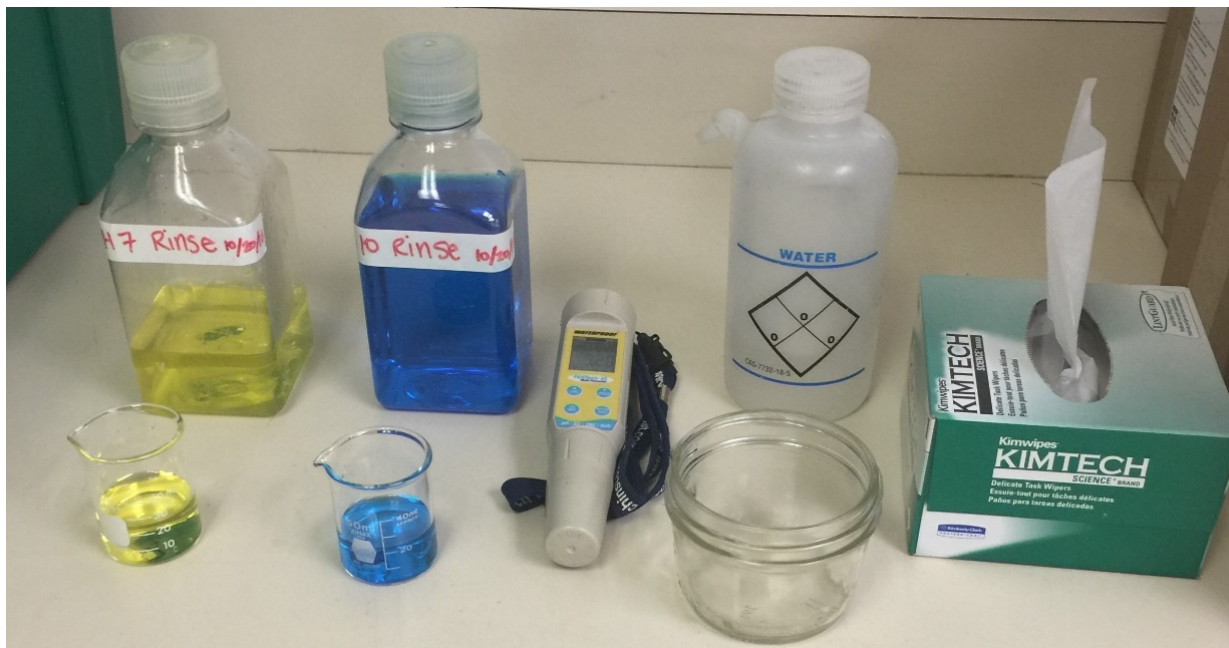


Figure 1. Materials used to calibrate pH: 7.0 buffer solution, 10.0 buffer solution, beakers, pH meter, deionized water in a squirt bottle, half-pint glass jar, laboratory wipes, and gloves (not shown).

3.0 PROCEDURES

3.1 Calibration of the PCSTestr35

- 3.1.1 Put on gloves and check the expiration date of the buffers before calibrating.
- 3.1.2 There are three different buffers: pH 4, 7, and 10. A two-point calibration requires two buffer solutions. A pH 4 and 7 buffer are used for water that is less than pH 7, and a pH 10 and 7 buffer are used for water that has a pH greater than 7. Pour each of the buffer solutions into separate beakers. **Do not place the pH probe directly into the stock buffer solutions.**
- 3.1.3 Press **On/Off** to turn on meter, and press **Mode/ENT** to change to pH mode (**Figure 2**, left).
- 3.1.4 Remove the cap and rinse the pH electrode with deionized (DI) water.
- 3.1.5 Immerse the sensor into one of the beakers that contains a pH buffer.

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Continuously and gently swirl the meter. Press **CAL**. The primary display will search and lock on the closest automatic calibration value (**Figure 2**, right).

- 3.1.6 Allow the primary display to stabilize while continuing to swirl, then press **Mode/ENT** to confirm the calibration value. The primary value will blink briefly before the secondary value automatically scrolls through the remaining pH buffers available for calibration.
- 3.1.7 Repeat steps 3.1.4 through 3.1.6 with additional buffers.
- 3.1.8 Press **CAL** to return to measurement mode.
- 3.1.9 Rinse the pH electrode with DI water.
- 3.1.10 Pour pH buffers down the sink, rinse beakers with DI water, and put away materials.

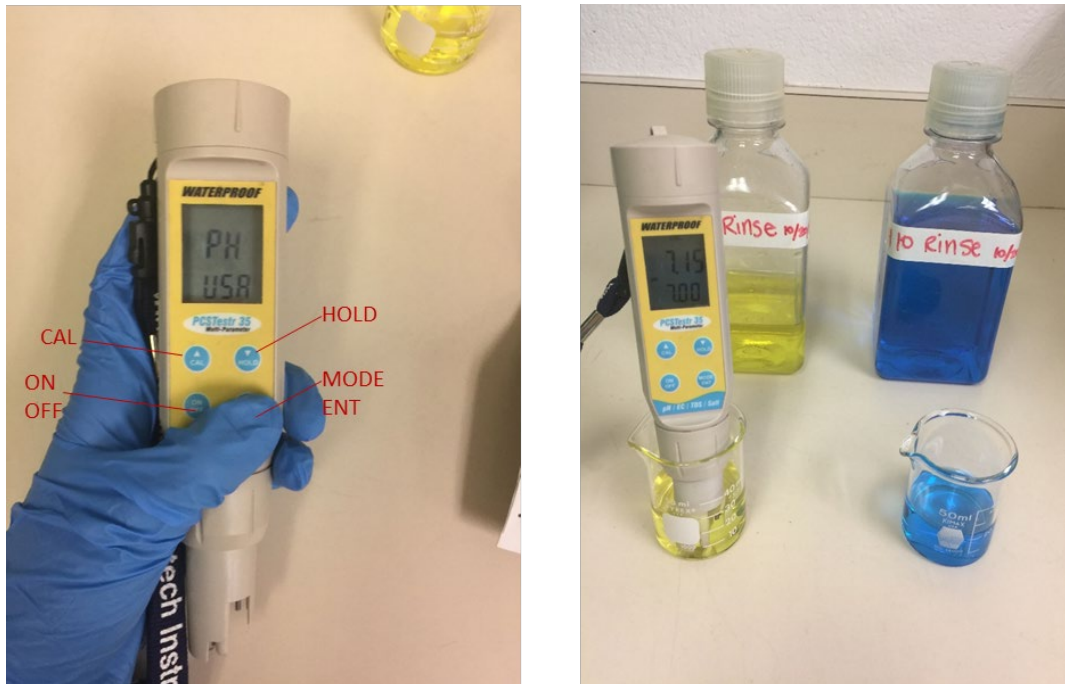


Figure 2. Left: PCSTestr35 pH meter displaying the pH mode. Right: PCSTestr35 pH meter submerged in a beaker with a pH buffer.

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3.2 Field Determination of pH

- 3.2.1 Put on gloves, and place a clean bag on the ground or vehicle to prevent contamination.
- 3.2.2 Remove the cap and rinse the pH electrode with deionized (DI) water.
- 3.2.3 Directly before samples are to be taken (after pumping the well), rinse the half-pint glass jar with groundwater three times. Then, fill up the half-pint jar with groundwater and place on the clean bag or hold while wearing gloves.
- 3.2.4 Press **On/Off** to turn on the meter and press **Mode/ENT** to change to pH mode.
- 3.2.5 Immerse the pH electrode into the jar (Figure 3). Continuously and gently swirl the electrode until the reading stabilizes.
- 3.2.6 Record the pH to the hundredth place and record the temperature in degrees Celsius on the Well Information Sheet and Chain of Custody forms (see FSWA001.03).
- 3.2.7 Rinse the pH electrode with deionized (DI) water and store in the well sampling kit.

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Sampling**



Figure 3. pH meter submerged in half-pint glass jar filled with a water sample.

4.0 REFERENCES

Barbash, J. E., & Resek, E. A. (1996). Pesticides in ground water: distribution, trends, and governing factors. Ann Arbor Press.

Kocis, T. 2020. Obtaining and Preserving Well Water Samples. Standard Operating Procedure Number: FSWA001.03. California Department of Pesticide Regulation, Environmental Monitoring Branch, Sacramento, California.