	<b>KATHMANDU UPATYAKA KHANEPANI LIMITED</b>  <b>WATER/WASTE WATER QUALITY ASSURANCE DIVISION</b> Mahankalchaur	SOP Code No:	PH001
		Version No:	
		Effective Date:	
	<b>STANDARD OPERATING PROCEDURE</b>  <b>pH measurement</b>	Pages:	1 of 7
		Developed by:	Puranjan Nepal
		Verified by:	Prem Paudyal
		Approved by:	Shailaja Adhikari

## 1. Scope and Objectives


To provide standard operating procedure for determining pH in drinking water.

pH of water has significance value on both environment and drinking water so it should be determined on daily basis Measurement of pH is one of the most important and frequently used tests in water chemistry. Practically every phase of water supply and wastewater treatment, e.g., acid-base neutralization, water softening, precipitation, coagulation, disinfection, and corrosion control, is pH-dependent.

## 2. Principle

The term pH refers to the measure of hydrogen ion concentration in a solution and defined as the negative log of  $H^+$  ions concentration in water and wastewater. The values of pH 0 to a little less than 7 are termed as acidic and the values of pH a little above 7 to 14 are termed as basic. When the concentration of  $H^+$  and  $OH^-$  ions are equal then it is termed as neutral pH.

The pH electrode used in the pH measurement is a combined glass electrode. It consists of sensing half cell and reference half cell, together form an electrode system. The sensing half cell is a thin pH sensitive semi permeable membrane, separating two solutions, viz., the outer solution, the sample to be analyzed and the internal solution, enclosed inside the glass membrane and has a known pH value. An electrical potential is developed inside and another electrical potential is developed outside, the difference in the potential is measured and is given as the pH of the sample.

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### 3. Equipment and Materials

- pH meter with electrode: HANNA Instruments <sup>pH</sup> (HI 2216)
- Beakers
- Magnetic stir plate and stir bars (optional)
- Soft Tissue

### 4. Reagents


- Pure water (e.g. deionized (DI), reverse osmosis (RO), distilled)
- pH calibration buffers (e.g. pH 4.01, 7.01, 10.01)
- pH electrode cleaning solution
- pH electrode storage solution

### 5. Sampling and Preservation

Sample collection will be done according to the water quality monitoring plan and SOPs for sample collection and Preservation

### 6. Electrode Preparation

- Remove protective cap from the electrode.
- Inspect the electrode for any scratches or cracks. If present, replace the electrode.
- Shake the electrode down to remove any air bubbles inside the glass bulb.
- Ensure that the electrode was cleaned and stored properly .
- Rinse electrode with pure water to remove any salt deposits.

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## 7. Calibration



- Step 1: Clean the Electrodes

After turning on the power to the pH meter, take the pH meter electrode from its storage solution and rinse with distilled water. Wipe it clean with a lint-free tissue.

- Step 2: Calibrate With the pH 7 Buffer




Submerge the rinsed electrode into the pH 7 buffer solution. Press the  button and wait


for the  LCD to blink. If the pH reads 7, then Press  button.

- Step 3: Calibrate With the pH 4 Buffer



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pH Meter automatically ask for buffer 4 after confirmation of 7 buffer. Then, rinse the electrode

again with distilled water and wipe clean with a lint-free tissue. And, wait for the  LCD

to blink. If the pH reads 4, then Press  button. Rinse the electrode again with distilled water and wipe clean with a lint-free tissue

- Step 4: Calibrate With the pH 10 Buffer

Do Same as buffer buffer 4. Press “Up Arrow” to skip any buffer.

- For accurate measurements, a minimum of a three-point calibration is recommended.
- After the final adjustment of pH, Instrument is ready to use.

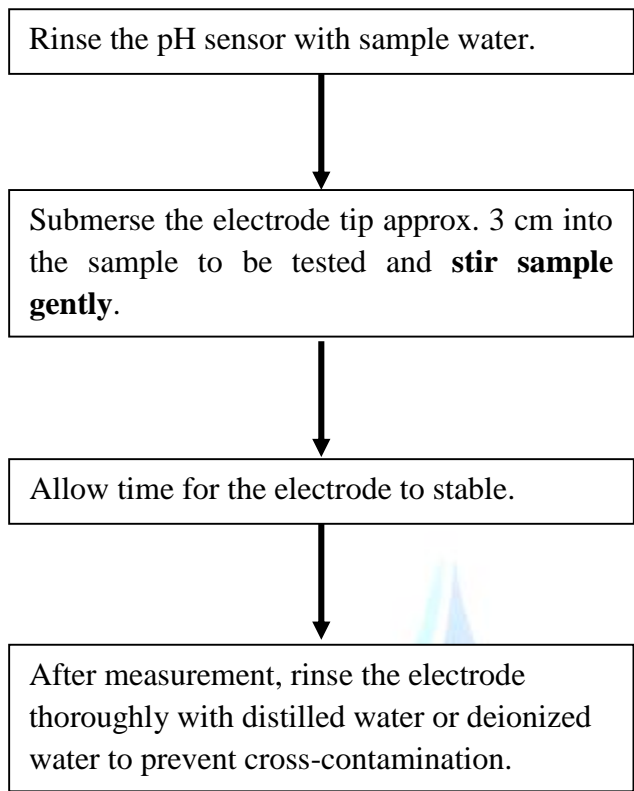
## 8. Measurement

*Reference: HANNA Instruments <sup>pH</sup> (HI 2216) operation guide, Calibration in standard mode (P.6-8)*

- ✓ Sample measurement should be started after calibration.
- ✓ **At least two measurements on a single sample** should be performed and evaluate the precision of the measured values (**Reference: SOP for Measurement data quality management**).



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## 9. Precision and bias

The precision and accuracy attainable with a given pH meter will depend on the type and condition of the instrument and the care used in standardization an operation. With proper care, a precision of  $\pm 0.02$  pH unit and an accuracy of  $\pm 0.05$  pH unit can be achieved. However,  $\pm 0.1$  pH unit represents the limit of accuracy under normal conditions. For this reason, report pH values to the nearest 0.1 pH unit.

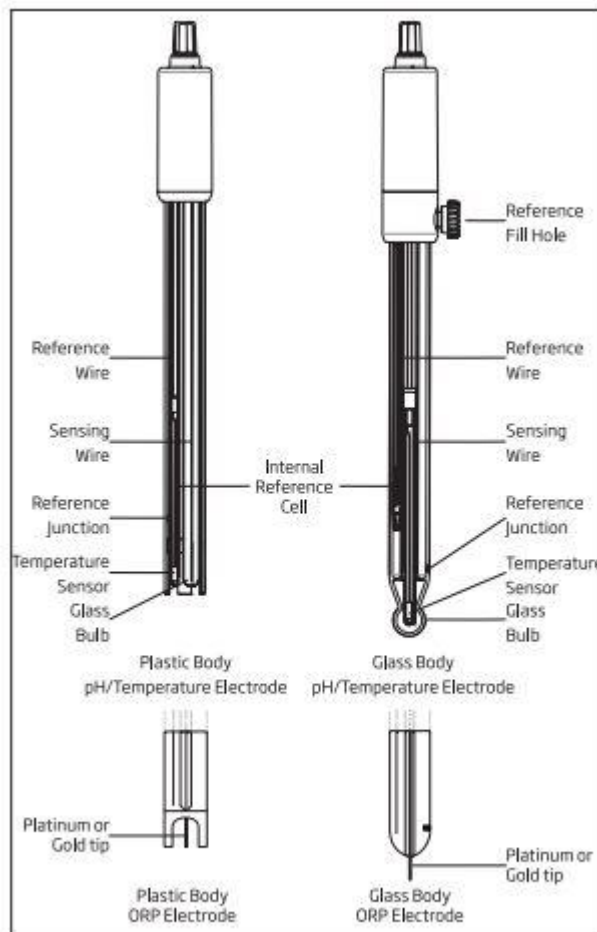



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## 10. Maintenance (After You Measure)

### 10.1 Electrode Cleaning

- Fill a 100 mL beaker with approximately 75 mL cleaning solution.
- Place the pH electrode into the cleaning solution for at least 15 minutes, making sure the junction is covered.
- If a refillable electrode is visibly contaminated, drain the reference electrolyte chamber with a syringe or capillary pipette and refill with fresh electrolyte. Allow the electrode to stand upright for one hour.
- Place in storage solution for at least 1 hour and re-calibrate before next use.



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### 10.2 Electrode Storage

- Replace the storage solution in the protective cap or beaker.
- Submerge the glass bulb and junction in protective cap or beaker with solution.
- A dry electrode should soak in storage solution for at least one hour prior to use and should be re-calibrated. However, overnight is optimal.



### 11. References

- ❖ Hanna pH Manual (2216)
- ❖ APHA
- ❖ SOP for Measurement data quality management
- ❖ SOP for sample collection and Preservation

