Applied Microbiology
&
Biotechnology Laboratory

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Standard Operating Procedure

AMBL-205-A

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pH Value of Water and Wastewater

METHOD SUMMARY

This SOP describes the procedure for measuring pH in waters and wastewaters. This method is based on Method 4500-H of *Standard Methods for the Examination of Water and Wastewater*, 23rd Edition.

ENVIRONMENTAL HEALTH AND SAFETY

Hazards Assessment: This method involves the use of pH buffer solutions having pH values of 4.0 and 10.0, and environmental samples having unknown pH value. Some environmental samples must be assumed to contain unknown chemical or biological hazards and are to be handled according to safe practice.

Buffers used for standardizing the pH meter are not considered to contain hazardous materials, however they are acidic (pH 4.0 buffer) or alkaline (pH 10.0 buffer).

Skin Contact: Repeated exposure may dry and crack skin.

Eye Contact: Contact can cause severe irritation, redness, swelling and blurred vision.

Ingestion: Although, unlikely to occur during the performance of this method, ingestion can cause nausea.

Inhalation: Exposure by inhalation is not expected.

Safety Equipment and Engineering Controls: This method requires that an eye wash station and a shower be located nearby.

Personal Protective Equipment (PPE): This method requires the use of the following PPE.

Gloves (nitrile, PVC or neoprene)
Safety goggles or glasses
Laboratory coat

Analysis-derived Wastes and Disposal:

Waste Generated	Hazardous (Y / N)	Disposal
This procedure generates small volumes of pH buffer solution.	N	May be disposed in a sink.

METHOD DESCRIPTION

1.0 Introduction and Applicability

The pH level of a waters, wastewaters, industrial wastewaters or culture in a treatment processes is one of the most common environmental measurements. In addition, pH is a parameter that is also used frequently throughout water chemistry as a method-defined parameter for controlling pH-dependent reactions, defining completion of analysis and sample preservation.

This method is applicable to all natural waters, including groundwater, municipal drinking and wastewaters, and industrial wastewaters and process waters.

2.0 Apparatus

a. pH meter, and a combination pH electrode with temperature compensation
b. Magnetic stirrer and stir bar
c. Beaker, size may vary

3.0 Reagents

a. Buffer solutions suitably prepared with known pH value, 4.0, 7.0, and 10.0, or commercially purchased solutions.
b. Electrode storage solution. Prepare a 4M potassium chloride (KCl) solution or use the solution recommended by the electrode manufacturer. Routinely check the storage solution for mold or bacterial growth, evaporation, and contaminants carried over from improperly rinsing sample from the electrode. Change or replenish the storage regularly or more frequently when growth or contaminants are noticed.

4.0 Procedure

a. Read Method 4500-H pH (*Standard Methods*) and be certain that you read and understand the pH meter manufacturer's instructions for the calibration and use of the meter, and the pH electrode manufacturer's instruction for the use of the electrode.

b. Once samples have equilibrated to room temperature, turn on and calibrate the pH meter according to manufacturer's instructions.

   1. Remove the storage bottle from the tip of the electrode by twisting it counterclockwise and gently pulling it downward and off the electrode body.
   2. Rinse the electrode body and tip thoroughly with deionized or distilled water, and then blot dry with a soft lint-free laboratory tissue. Do not wipe or rub the tissue across the surface of the glass electrode.
   3. Select calibration mode on the pH meter. Calibrate the meter beginning with pH 4.0 buffer, followed by pH 7.0 buffer and finally with pH 10.0 buffer. Buffers should also be at room temperature.
   4. Fill three small beakers with enough of each buffer to be able to immerse the sensing tip of the electrode below the surface. Either stir with a stir bar, or gently swirl the contents of the beaker by hand. Keep the electrode sensing tip adequately immersed in the buffer solution at all times.
   5. Once the calibration point has been set, remove the electrode from the buffer, rinse with deionized or distilled water, and then blot (do not rub) dry with a soft lint-free tissue.
   6. After the final buffer, remove the electrode, rinse with deionized or distilled water, and then blot (do not rub) dry with a soft lint-free tissue.

c. Transfer enough sample into a beaker to immerse the sensing tip of the electrode below the surface. Always be sure that the electrode body has been well rinsed and dried before using. Gently stir the sample and immerse the electrode. Stirring should be only enough to uniformly mix the sample; avoid aerating the sample to minimize carbon dioxide entrainment.

d. Once the pH reading has equilibrated (see manufacturer's instructions) record the pH value. Report the pH value measured to the nearest 0.1 pH unit.

e. Remove the electrode from the sample, rinse with reagent water, and then blot (do not rub) dry with a soft lint-free tissue.

f. When finished, return the pH electrode to the storage solution bottle by twisting the bottle counterclockwise and gently moving it upward on the electrode body.

g. Turn off the pH meter.

5.0 Quality Control

Always standardize the pH meter after it has been turned on and before it is used to measure pH. Follow manufacturer's instructions on care and troubleshooting the electrode.

Analyze at least one sample in duplicate for each batch of 20 or fewer samples. If a single sample is being analyzed, this sample must be analyzed in duplicate. Acceptance criteria for duplicate analysis of pH in water using this method is $\pm$ 0.2 pH units.

6.0 Bibliography

1. Rodger B. Baird, Andrew D. Eaton, and Eugene W. Rice (2017) *Standard Methods for the Examination of Water and Wastewater*. 22rd Edition. APHA, Washington, DC.