UNCONTROLLED

WEST VALLEY NUCLEAR SERVICES CO., INC.

ANALYTICAL CHEMISTRY METHOD
ANALYTICAL AND PROCESS CHEMISTRY

ACM-pH-2601, Rev. 1
Effective Date: 06/28/89

pH (ELECTRODE METHOD)

Approved by:

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Analytical Chemistry

Part I

1.0 PURPOSE

1.1 This method establishes the technique to be used to determine the pH of a sample.

2.0 APPLICATION

2.1 This method covers the determination of pH by electrode metric measurement using a standard combination electrode as the sensor.

3.0 DISCUSSION

3.1 Summary of Method

3.1.1 The pH meter is standardized against two reference buffer solutions which bracket the anticipated sample pH. The sample measurement is made under strictly controlled conditions and prescribed techniques.

3.2 Significance

3.2.1 The pH determination of water is a relatively reliable indication of its acidic or alkaline tendency. It is not a measure of the quantity of acidity or alkalinity in a water sample. A pH value less than 7.0 shows a tendency towards acidity while a value greater than 7.0 shows a tendency toward alkalinity. Most natural waters range between 6.0 and 9.0, but there are notable exceptions such as mine drainage

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water and unbuffered rain water. The pH measurement is an important consideration in determining the corrosive action of water and assessing water treatment practices for industrial processes.

3.3 Interferences

3.3.1 The standard combination electrode reliably measures pH in nearly all aqueous solutions and in general is not subject to solution interference from color, turbidity, colloidal matter, oxidants, or reductants.

3.3.2 The true pH of an aqueous solution or extract is affected by the temperature. The temperature effect is automatically defaulted to ambient temperature of the instrument.

> 3.3.3 If ambient differs markedly from the temperature of the standard or sample, use an automatic temperature compensator (ATC) probe. If the ATC probe is not available, then it is imperative that the sample be allowed to equilibrate for a minimum of one hour in the same environment as the buffers and QC samples.

4.0 REFERENCES

4.1 Standard Methods for the Examination of Water and Waste Water, 16th edition, 423 pH Value.

Part II

5.0 EQUIPMENT

5.1 Beckman pHI 20 pH meter

5.1.1 Laboratory pH meter with automatic temperature compensator probe and/or based upon ambient temperature from an internal sensor

5.2 Combination electrode (gel type) with compatible connection to meter

6.0 REAGENTS AND STANDARDS

6.1 Commercially available prepared buffer solutions (e.g., "Baker Analyzed" Reagents: pH = 4, 7, and 10) are used for the standardization of the electrode. Reference solutions shall be disposed of on the expiration date listed on the manufacturer's container.

7.0 SAFETY PRECAUTIONS

7.1 Normal safe laboratory practices should be followed when preparing reagents and operating the pH meter.

8.0 RECORDS

8.1 All measurement data and sample identification shall be recorded on the worksheet (Attachment A). The final result shall be recorded on the analytical request sheet (PRD 5.1)

9.0 CALIBRATION AND CONTROL

> 9.1 Calibrate the electrode using two standard buffer solutions of pH 4 and pH 10 at the same temperature as the QC sample if an ATC probe is not available.

The microcomputer notes the millivolt output, known pH values, and temperatures of the two standards. From this information the microcomputer constructs a two-point line and calculates the slope which is a measure of the response of an electrode in millivolts per pH unit. The value for the slope and the offset from the ideal electrode response are stored in memory.

> 9.2 A check on a third standard used as a quality control (QC) standard will be run to check accuracy. A quality control log book and control charts will be used to record all QC checks. Calibration of equipment shall be done on each work day that samples are received for pH.

10.0 PROCEDURE

10.1 Instrument Calibration

10.1.1 Bring sample and buffer to same ambient room temperature or use an automatic temperature compensator (ATC).

10.1.2 Before use, remove electrode from its soaking solution, rinse with distilled water, and blot dry.

10.1.3 Depress CLR (clear) Key and place electrode and ATC probe, if used, in the first standard solution (pH = 4.0). Depress STANDARD Key and wait until Auto Read locks the display. Rinse the electrode and ATC probe, if used, and place in second standard solution (pH = 10.0). Depress STANDARD Key and wait until Auto Read locks the display again. Remove electrode and ATC probe, if used, and rinse.

10.1.4 Quality control is performed with a third standard (pH = 7.0) as in 10.2.1.

10.2 Sample Analysis

10.2.1 Immerse electrode and ATC probe, if used, into sample making sure the sample is being stirred to assure homogeneity. Depress the pH Key and wait until Auto Read locks the display before recording the value.

> A. If the ATC probe is not available, then it is imperative that the sample be allowed to equilibrate for a minimum of one hour in the same environment as the buffers for standardization and QC check.

10.2.2 Remove electrode and ATC probe, if used, rinse, and return the electrode to the soaking solution or proceed to next sample repeating the above steps.

10.2.3 If running several samples, repeat 10.1.4 for every fifth sample and after the last sample.

11.0 CALCULATION

11.1 The pH meter is calibrated in pH units. The pH of the sample is obtained directly by reading the meter scale.

12.0 ATTACHMENT

Attachment A - pH Work Sheet

ATTACHMENT A

pH WORK SHEET

SAMPLE NAME _____ LOG NUMBER _____

SPECIAL INSTRUCTIONS _____

_____

pH Meter (model & serial no.) _____

SAMPLE ID					
>AMBIENT TEMP.					
STANDARD #1 pH					
STANDARD #2 pH					
CHECK STD. pH					
>SAMPLE TEMP.					
SAMPLE pH					

ANALYST _____ DATE _____

APPROVED _____ DATE _____