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Standard Operating Procedure for pH Meter, SM4500-H+ B for Microbial Laboratory

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1 Scope and Application

1.1 This method is applicable to samples of media and reagents. The pH of the sample is determined electrometrically using a reference electrode.

2 Definitions

2.1 Refer to Chapter 3 of the Georgia EPD Laboratory Quality Assurance Manual for Quality Control Definitions.

3 Interferences

3.1 Coatings of oily material or particulate matter can impair electrode response. These coatings can usually be removed by gentle wiping or detergent washings, followed by DI water rinsing. An additional treatment with hydrochloric acid (1+9) may be necessary to remove any remaining film.

3.2 Avoid rubbing or wiping of electrode bulb, to reduce chance of error due to polarization.

4 Safety

4.1 Refer to Laboratory Chemical Hygiene Plan, online revision.

5 Apparatus and Equipment

5.1 Accument AB150 pH Meter/Accument AB15 pH Meter

5.2 50 mL or 100 mL glass beakers

5.3 pH sensing electrode and reference electrode with automatic temperature compensation

5.4 Stir plate and stir bar

5.5 Rinse bottle

6 Reagents

6.1 Calibration Standards: the calibration standards are pH 7.00 and pH 4.00 Buffer solutions that are purchased, certified and commercially prepared.
6.2 Deionized Water (DI)
6.3 Electrode filling solution

7 Sample Collection

7.1 Refer to Chapter 5 of the Georgia EPD Laboratory Quality Assurance Manual for Sample Container, Sample Preservation, and Sample Holding Times.

8 Calibration

8.1 The pH meter is calibrated daily before use.
8.2 Two-Buffer Calibration: Each instrument/electrode system must be calibrated at a minimum of two points that bracket the expected pH of the samples and are approximately three pH units or more apart.
8.3 The two different standards must be calibrated consecutively, with no intervening sample measurements.
8.4 Always use fresh buffers for calibration.
8.5 Do not use calibration buffers after their expiration date. Keep the container tightly capped and stored according to the manufacturer's instructions. Never put used buffer back into the container of new buffer.

9 Quality Control

9.1 Refer to Table 14.1 for Reporting Limits (PQLs), Table 14.2 for Quality Control Acceptance Criteria, and Table 14.3 for Quality Control Procedures associated with this method.

10 Procedure

10.1 **Accument AB150**
10.1.1 Calibration is performed daily before use of the pH meter. Record the lot numbers of the buffers being used in the appropriate logbook.
10.1.2 Press **ON** button
10.1.3 Inspect electrode for crystallization and inspect fluid level. (NOTE: If the electrolyte level is lower than ¼in or so below the cap, add the appropriate filling solution using the spout cap on the filling bottle.)
10.1.4 Open electrode probe filling hole by turning the purple ring to the left.
10.1.5 Press **STD** button
10.1.6 Press **Clear** "clear existing values?" press **Enter** to CONFIRM.
10.1.7 Rinse electrodes first with distilled water and blot (do not wipe). (Note: Wiping the bulb may produce an interfering electric charge.)
Pour fresh 4.00pH buffer (enough to cover the reference junction of the pH meter probe) into a clean 50mL or 100mL glass beaker. Add a

stirring bar and place beaker on stir plate. Turn stir plate on to gently stir buffer. Place electrode in buffer (ensure the reference junction is covered).

10.1.8 Press **STD** to standardize.

10.1.9 Record pH properly in pH logbook.

10.1.10 Rinse electrodes with DI water and blot (do not wipe). Pour fresh 7.00 pH buffer (enough to cover the reference junction of the pH meter probe) into a clean 50mL or 100mL glass beaker. Add a stirring bar and place beaker on stir plate. Turn stir plate on to gently stir buffer. Place electrode in buffer (ensure the reference junction is covered).

10.1.11 Press **STD** to standardize

10.1.12 Record pH properly in pH logbook

10.1.13 After the second buffer value has been entered, press **REPORT**. The electrode slope will be displayed. The slope should be between 90% and 102% per electrode manufacturer's instructions. If the slope is within range, record it in the proper logbook. If the slope is outside of the above mentioned range, reinspect the electrode and recalibrate the meter.

10.1.14 Rinse electrode with DI water and blot (do not wipe).

10.1.15 Press **ESC** to go back to the main screen

10.1.16 The pH meter is now properly calibrated and the pH of samples can be taken.

10.1.17 Close electrode probe filling hole by turning the purple ring to the right. The electrode probe filling hole should be closed when not in use.

10.1.18 Store the electrode in pH 7.00 buffer

10.1.19 Neutralize the 4.0 buffer to a pH between 5.5 and 10 then discard.

10.2 **Accument AB15**

10.2.1 Calibration is performed daily before use of the pH meter. Record the lot numbers of the pH buffers to be used in the proper book.

10.2.2 Inspect electrode for crystallization and inspect fluid level. (NOTE: If the electrolyte level is lower than ¼in or so below the cap, add the appropriate filling solution using the spout cap on the filling bottle.)

10.2.3 Open the electrode probe filling hole by turning the purple ring to the left.

10.2.4 To clear previous standardization press **SETUP** twice.

10.2.5 Press **ENTER** to clear all existing buffers.

10.2.6 Rinse the electrode with DI water and blot (do not wipe). (Note: Wiping the bulb may produce an interfering electric charge.)

10.2.7 Decant fresh pH 4.00 buffer (enough to cover the reference junction of the pH meter probe) into a clean 50mL or 100mL beaker and add a stir bar.

10.2.8 Place the beaker on a stir plate and moderately stir the buffer.

10.2.9 Immerse the probe into the buffer (ensure the reference junction is covered).

10.2.10 Press **STD** to access the standardized mode. Once the reading stabilizes press **STD** again to initiate standardization. Record the pH in the proper logbook.

10.2.11 Repeat steps 10.2.6-10.2.10 substituting the 7.00 buffer for the 4.00 buffer.

10.2.12 After the meter accepts the second buffer, it will briefly display the percentage slope. If the slope is within the range of 90%-102%, the meter will display "GOOD ELECTRODE". Record the slope in the proper logbook. If the slope is outside of the abovementioned range, reinspect the electrode and recalibrate the meter.

10.2.13 The pH meter is now properly calibrated and ready for use.

10.2.14 Neutralize the 4.0 buffer to a pH between 5.5 and 10 then discard.

10.2.15 Rinse the electrode with DI water. Close the electrode probe filling hole. Store the electrode in pH 7.00 buffer when not in use.

11 Calculations

11.1 The pH meter reads directly in pH units. Report pH to the nearest 0.1 unit.

12 Waste Management

12.1 See GA EPD Laboratory SOP-EPD Laboratory Waste Management Standard Operating procedures, online revision.

13 References

13.1 SM4500H+B -Standard Methods for the Examination of Water and Wastewater 20th Edition, American Public health Association: Washington, D.C., 1998.

13.2 Fisher Scientific accumet® Basic (AB) Benchtop Meters Instruction Manual

13.3 Fisher Scientific accumet® Basic (AB15/15+) User Manual

13.4 GA EPD Laboratory SOPs – Initial Demonstration of Capability SOP 6-001, online revision and Continuing Demonstration of Capability SOP 6-002, online revision.

13.5 GA EPD Laboratory Quality Assurance Plan, online revision.

13.6 GA EPD Laboratory SOP – EPD Laboratory Waste Management SOP, SOP 6-015, online revision.

13.7 GA EPD Laboratory Safety/Chemical Hygiene Plan & Fire Safety Plan, online revision.

14 Practical Quantitation Limits (PQLs) Precision and Accuracy Criteria, and Quality Control Approach

Table 14.1 RLs for Method SM4500-H+ B

Parameter/Method	Analyte	Matrix (aqueous)	
		RL	Unit
SM4500-H+ B	pH	NA	pH units

Table 14.2 Acceptance Criteria for Method SM4500-H+ B

Method	Analyte	Accuracy Water (%R)	Precision Water (pH Units)
SM4500-H+ B	pH	NA	0.1

Table 14.3 Summary of Calibration and QC Procedures for Method SM4500-H+ B

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance criteria	Corrective Action	Flagging Criteria
SM4500-H+ B	pH	IDC - Initial Demonstration: Demonstrate ability to generate acceptable accuracy and precision using four analysis of a QC check sample, a DI water blank & an unknown blind sample.	Once per analyst	QC Acceptance Criteria Table 14.2 and Initial demonstration SOP	Determine source of error, correct, recalibrate and perform analysis of all QC check samples again.	
		CDC - Continuing Demonstraton of Capability	Every six months after IDC.	QC Acceptance Criteria Table 14.2 and Continuing Demonstration SOP	Determine source of error, correct, recalibrate and perform analysis of all QC check samples again.	
		Initial Calibration	Each day prior to use and after any extended period (1 hour or more) since previous use	See individual instrument requirements listed in Section 10. Calibration standards should bracket the	Determine source of error, correct and recalibrate. If a measured pH is not within calibration range, recalibrate with pH buffer	

Table 14.3 Summary of Calibration and QC Procedures for Method SM4500-H+ B

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance criteria	Corrective Action	Flagging Criteria
				expected pH.	standards that will bracket the value measured and re-analyze sample.	
		Continuing Calibration Check (CCC)	After every 15 minutes of use, or at least once per hour if used infrequently	pH value must be within 0.1 units of expected value	Recheck one time with a fresh aliquot of buffer and if not within limits correct problem recalibrate instrument	

SOP Updates to Previous Version:
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