

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS
WASHINGTON 25, D.C.

National Bureau of Standards Certificate

Standard Sample 187 a

Borax
(pH Standard)

Purity

This lot of borax ($\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$)* was prepared to ensure high purity and uniformity. It meets the specifications of the American Chemical Society for reagent-grade material.

pH Values

The pH values at 25° C for four concentrations of solutions of borax are as follows:

<i>Molarity</i>	<i>pH</i>	<i>Molarity</i>	<i>pH</i>
0.005	9.19	0.025	9.17
.01	9.18	.05	9.20

The 0.01-molar solution is recommended for the calibration of pH equipment. The pH of this solution as a function of temperature is given below:

°C	pH	°C	pH	°C	pH
0	9.46	25	9.18	50	9.01
5	9.39	30	9.14	55	8.99
10	9.33	35	9.10	60	8.96
15	9.27	40	9.07	70	8.93
20	9.22	45	9.04	80	8.89
				90	8.85
				95	8.83

The pH values are recorded to the nearest 0.01 unit. They were derived from emf measurements of cells without liquid junction with equations and values for the natural constants accepted by the National Bureau of Standards. The given values of pH correspond as closely as possible to $\log(1/a_{\text{H}^+})$ where a_{H^+} is a conventional activity of hydrogen (hydronium) ion referred to the standard state on the scale of molality.

*The water content of this salt, stored under ordinary conditions, is less than theoretical. This does not effect the use of this salt as a pH standard, but would interfere were the partially desiccated salt used as a boron or acidimetric standard.

Directions for Use

Preparation of a 0.01-molar solution: Crush gently any large lumps of the salt (the salt must not be dried in an oven before use). Transfer 3.81 g of the salt to a 1-liter volumetric flask, dissolve and fill to the mark with distilled water having a pH of not less than 6.5 and not more than 7.5. Water of this quality can be obtained by boiling distilled water for 15 min. and cooling it under carbon dioxide-free conditions. To avoid appreciable contamination of the buffer solution with atmospheric carbon dioxide, keep the stopper in place except when transferring some of the solution or protect the solution by use of a soda-lime tube. In the calibration of pH equipment, the use of the buffer in air within 10 min. after its removal from the bottle will ordinarily be permissible. The 0.01-M solution prepared on the volume (molar) basis has a pH value within 0.001 unit of that prepared on the weight (molal) basis.

A. V. ASTIN, *Director*

WASHINGTON 25, D.C., January 5, 1960