S. Department of Commerce
C. William Verity
Secretary

National Bureau of Standards
Ernest Ambler, Director

National Bureau of Standards

Certificate of Analysis

Standard Reference Materials

Potassium Dihydrogen Phosphate (186-I-d)
Disodium Hydrogen Phosphate (186-II-d)

These Standard Reference Materials (SRM's) are for preparing solutions to be used to calibrate pH measuring systems. These lots of potassium dihydrogen phosphate (KH_2PO_4) and disodium hydrogen phosphate (Na_2HPO_4) meet the specifications of the American Chemical Society for reagent-grade materials, but should not be considered as entirely free from impurities such as traces of water, free acid or alkali, carbon dioxide, chlorides, sulfur compounds and heavy metals.

The pH(S) values listed below correspond to $\log(1/a_H)$, where a_H is the conventional activity of the hydrogen ion referred to the standard state ($p^o = 1$ atmosphere) on the scale of molality. The values were derived from the emf of cells without liquid junction by the method of calculation described in the Journal of Research of the National Bureau of Standards, **66A**, 179 (1962). The uncertainty of the assigned values of pH(S) is estimated not to exceed ± 0.005 unit from 0 to 50 °C. The values listed below apply only to the lots on this certificate. Minor variations of pH(S) values (of the order of a few thousandths of a unit) may be expected to occur between different SRM lots.

A solution 0.025 molal with respect to both KH_2PO_4 and Na_2HPO_4 is recommended for the calibration of pH equipment. The pH(S) of this solution as a function of temperature is given below:

°C	pH(S)	°C	pH(S)	°C	pH(S)
0	6.988	20	6.880	40	6.833
5	6.955	25	6.863	45	6.830
10	6.926	30	6.850	50	6.829
15	6.901	35	6.840		

For pH measurements in the physiologically important range pH 7 to 8, a solution 0.008695 molal in KH_2PO_4 and 0.03043 molal in Na_2HPO_4 is also useful. The pH(S) values for this solution as a function of temperature follow: [See Journal of Research of the National Bureau of Standards, **65A**, 267, (1961).]

°C	pH(S)	°C	pH(S)	°C	pH(S)
0	7.530	20	7.426	37	7.387
5	7.497	25	7.410	40	7.384
10	7.470	30	7.398	45	7.382
15	7.446	35	7.390	50	7.382

The technical and support aspects involved in the preparation, certification, and issuance of this Standard Reference Material were coordinated through the Office of Standard Reference Materials by W.P. Reed.

Gaithersburg, MD 20899
March 11, 1988

Stanley D. Rasberry, Chief
Office of Standard Reference Materials

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An uncertainty of ±0.003 pH unit is estimated. The pH values were derived from emf measurements of cells without liquid junctions, and equations and values for the natural constants accepted by the National Bureau of Standards.

DIRECTIONS FOR USE

Preparation of a 0.025-molar solution: Transfer 3.402 g of the potassium dihydrogen phosphate (186-I) and 3.549 g of the disodium hyd ogen phosphate (186-II) to a 1-liter volumetric flask, dissolve and fill to the mark with distilled water having a pH of not less than 6.5 nor more than 7.5. Water of this quality can be obtained by boiling distilled water for 15 minutes and cooling it under carbon-dioxide-free conditions. For work within 0.01 pH unit, distilled water of ordinary grade (pH 5.6 to 8.0) may be used. The salts should be dried for 2 hours at 130° C before use. No special precautions to prevent contamination of the buffer solution with atmospheric carbon dioxide are necessary. The 0.025-M solution prepared on the volume (molar) basis has a pH value within 0.001 unit of that prepared on the weight (molal) basis.

(Signed) E. U. CONDON, Director.
G.E.F.L.

November 13, 1945.