



Certificate of Analysis

Standard Reference Material 186b

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

Purity

These lots of potassium dihydrogen phosphate (KH_2PO_4) and disodium hydrogen phosphate (Na_2HPO_4) were prepared to insure high purity and uniformity. They 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.

$p\text{H}(\text{S})$ Values

The $p\text{H}(\text{S})$ values listed below correspond to $\log(1/a_{\text{H}})$, where a_{H} is a conventional activity of the hydrogen (hydronium) ion referred to the standard state 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 $p\text{H}(\text{S})$ is estimated not to exceed ± 0.005 unit from 0 to 60 °C and ± 0.01 unit from 70 to 95 °C.

The solution 0.025 molal with respect to both KH_2PO_4 and Na_2HPO_4 is recommended for the calibration of $p\text{H}$ equipment. The $p\text{H}(\text{S})$ of this solution as a function of temperature is given below:

°C	$p\text{H}(\text{S})$	°C	$p\text{H}(\text{S})$	°C	$p\text{H}(\text{S})$
0	6.984	30	6.853	55	6.834
5	6.951	35	6.844	60	6.836
10	6.923	38	6.840	70	6.845
15	6.900	40	6.838	80	6.859
20	6.881	45	6.834	90	6.877
25	6.865	50	6.833	95	6.886

For $p\text{H}$ measurements in the physiologically important range $p\text{H}$ 7 to 8 a solution 0.008695 molal in KH_2PO_4 and 0.03043 molal in Na_2HPO_4 is also useful. The $p\text{H}(\text{S})$ values for this solution as a function of temperature follow:

[See Journal of Research of the National Bureau of Standards, 65A, 267 (1961).]

°C	$p\text{H}(\text{S})$	°C	$p\text{H}(\text{S})$	°C	$p\text{H}(\text{S})$
0	7.534	25	7.413	45	7.373
5	7.500	30	7.400	50	7.367
10	7.472	35	7.389		
15	7.448	38	7.384		
20	7.429	40	7.380		

Directions for Use

Preparation of the 0.025-molal solution. Transfer 3.388 g of the potassium dihydrogen phosphate (186-I-b) and 3.533 g of the disodium hydrogen phosphate (186-II-b) to a 1-liter volumetric flask. Dissolve and fill to the mark with distilled water at 25 °C. The distilled water should not contain dissolved carbon dioxide and should have a conductivity no greater than 2×10^{-6} ohm⁻¹ cm⁻¹. Carbon dioxide-free water can be prepared by boiling a good grade of distilled water for 10 min and guarding it with a soda-lime tube while cooling. The salts should be dried for 2 hr at 110 °C to 130 °C before use. Although elaborate precautions to prevent contamination of the buffer solution with atmospheric carbon dioxide are usually unnecessary, the container should be kept tightly stoppered at all times when a sample is not actually being removed.

The physiological standard solution $p\text{H}(\text{S})=7.413$ at 25 °C, is prepared by transferring 1.179 g of potassium dihydrogen phosphate (186-I-b) and 4.302 g of disodium hydrogen phosphate (186-II-b) to a 1-liter volumetric flask, dissolving, and filling to the mark with water of the quality described above. This buffer solution is more sensitive to contamination with carbon dioxide than is the 0.025-molal solution. If the solution is to maintain the assigned $p\text{H}(\text{S})$ for a few weeks, therefore, exclusion of carbon dioxide may be essential.

WASHINGTON, D.C. 20234
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W. Wayne Meinke, Chief,
Office of Standard Reference Materials,

The potassium dihydrogen phosphate was obtained from the Mallinckrodt Chemical Works of St. Louis, Missouri. The experimental work leading to the certification of this material was carried out by V. E. Bower.

The overall direction and coordination of technical measurements leading to the certification were performed under the chairmanship of R. G. Bates.

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 T. W. Mears.

PREPARATION OF THE 0.025-MOLAL SOLUTION

Transfer 3.388 g of the potassium dihydrogen phosphate (186-I-c) and 3.533 g of the disodium hydrogen phosphate (186-II-b) to a 1-liter volumetric flask. Dissolve and fill to the mark with distilled water at 25 °C. The distilled water should not contain dissolved carbon dioxide and should have a conductivity no greater than 2×10^{-6} ohm⁻¹ cm⁻¹. Carbon dioxide-free water can be prepared by boiling a good grade of distilled water for 10 minutes and guarding it with a soda-lime tube while cooling. The salts should be dried for 2 hours at 110 °C to 130 °C before use. Although elaborate precautions to prevent contamination of the buffer solution with atmospheric carbon dioxide are usually unnecessary, the container should be kept tightly stoppered at all times when a sample is not actually being removed.

The solution should be replaced after a few weeks or sooner if molds or sediment appear, or if it has been exposed repeatedly to air containing carbon dioxide.

PREPARATION OF THE PHYSIOLOGICAL STANDARD SOLUTION

The physiological standard solution pH(S) = 7.410 at 25 °C, is prepared by transferring 1.179 g of potassium dihydrogen phosphate (186-I-c) and 4.302 g of disodium hydrogen phosphate (186-II-b) to a 1-liter volumetric flask, dissolving, and filling to the mark with water of the quality described above. (The figures given are weights in air.)

This buffer solution is more sensitive to contamination with carbon dioxide than is the 0.025-molal solution. If the solution is to maintain the assigned pH(S) for a few weeks, therefore, exclusion of carbon dioxide may be essential.