

pH measurement —

Part 1: Specification for pH scale

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Laboratory Apparatus Standards Committee (LBC/-) to Technical Committee LBC/16 upon which the following bodies were represented:

- British Kinematograph, Sound and Television Society
- British Pharmacopoeia Commission
- Chemical Industries Association
- Department of Trade and Industry (National Physical Laboratory)
- Electricity Supply Industry in England and Wales
- GAMBICA (BEAMA Ltd.)
- Institute of Medical Laboratory Sciences
- Royal Society of Chemistry
- Sira Ltd.
- Society for Applied Bacteriology
- Society of Chemical Industry
- Society of Dairy Technology
- Society of Glass Technology
- University of Newcastle-upon-Tyne

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Foreword

This British Standard was first published in 1950 and was prepared by a technical committee directly under the aegis of the Chemical Divisional Council following recommendations made at a conference, held in 1948 at the request of the Royal Society, to discuss the need for a standard pH scale. It was revised in 1961 to extend the temperature range covered in the definition of pH from between 0 °C and 60 °C to between 0 °C and 95 °C. This revision, in two Parts, of BS 1647 has been prepared under the direction of the Laboratory Apparatus Standards Committee by the technical committee responsible for BS 2586 and BS 3145. This Part, together with Part 2, supersedes BS 1647:1961 which is withdrawn.

At the time of preparation of this revision of this British Standard, discussions were under way with a view to harmonizing the standards and recommendations were being prepared by four international organizations. These were:

Subcommittee 1 (General methods) of TC 47 (Chemistry) of the International Organization for Standardization (ISO), Subcommittee D (Analysing equipment) of TC 66 (Electronic measuring equipment) of the International Electrotechnical Commission (IEC), the International Organization for Legal Metrology (OIML) and the International Union for Pure and Applied Chemistry (IUPAC).

The technical committee responsible for this Part of this standard played a leading role in this work and, as a safe-guard against the possibility of agreement not being reached in the short term, recommended the publication of this revision. It is based on a critical re-examination of some of the earlier experimental work and on new work carried out at the University of Newcastle-upon-Tyne.

The object of this Part of this standard is to ensure that, when different workers refer to a stated value of pH to two or more decimal places, they mean the same thing to within 0.01 in the temperature range 0 °C to 60 °C and approaching 0.01 at higher temperatures. It is occasionally desirable to measure and to quote pH values to more than two decimal places, but the significance of such additional figures may sometimes be uncertain. The principal change in this revision is to include more details of the procedures for making pH measurements in order that they may have the greatest possible reproducibility and repeatability.

The definition adopted for pH is an operational one, i.e. it is based on the operation used to determine it using an electrochemical cell, referred to as the “operational cell” in this Part of this standard. No simple physical interpretation of pH values can be made in terms of either hydrogen ion concentration or hydrogen ion activity except when the test solution is a dilute aqueous electrolyte solution of simple composition. For this reason, pH should be regarded as simply a reproducible scale related to “acidity”, and this is all that is required for most technological purposes. For the interpretation of pH values, see Appendix A.

When the test solution contains organic matter, suspended or dissolved, reproducibility may not be high but is usually adequate for the purposes for which the pH measurement is required. The definition of the pH scale in terms of a single reference value standard solution has been reaffirmed. This definition differs from most other definitions of pH scales given in national standards (see review [1]) which, in common with the scale adopted by the National Bureau of Standards (NBS), USA [2] are multi-standard scales. Nevertheless, within 0.02, and possibly less, in the pH range 3 to 9 and the temperature range 0 °C to 60 °C, there is no practical difference between the pH scale defined in this Part of this standard and the NBS recommendations. A general account of the problems of pH standardization and measurement can be found elsewhere (see [3] and [4]).

The pH value of an unknown solution is measured with a pH meter against the pH scale specified in this standard using the operational standard solutions specified in Part 2 of this standard for calibration of the pH meter.

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Summary of pages

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This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.