CALIBRATION

- Calibration is a process that demonstrates a particular instrument or device produces results within specified limits, as compared to those produced by a definite standard over an appropriate range of measurements.
- Calibration is the process of adjusting an instrument or equipment to meet the manufacturer's specification.
- Calibration is performed using primary reference standard.

Scope/ Purpose/ Need of calibration:

- To determine the accuracy, precision, and deviation of the measurements produced by all the instruments.
- To establish the reliability of the instrument being used and whether it can be trusted to deliver repeatable results each time.
- To make sure that the pH readings of equipment/ instrument are consistent and correct every single time.
- pH is the quantitative measure of the acidity or basicity of aqueous or other liquid solutions.

pH METER

The pH is determined by measuring the concentration of the hydrogen ion, denoted as [H+].

A solution with a pH less than 7 is considered acidic; a solution with a pH greater than 7 is considered basic, or alkaline.

pH is calculated as the negative log of the H+ concentration (pH = -log[H+]).

How does it work?

These devices are designed with two electrodes, one for sensing hydrogen ions and one for reference.

The sensing electrode detects changes in voltage based on hydrogen ion activity, while the reference electrode provides a constant voltage for comparison.

The difference between the two voltages is displayed as a pH value by the meter, with higher voltages signalling acidic pH levels and lower voltages signalling basic.

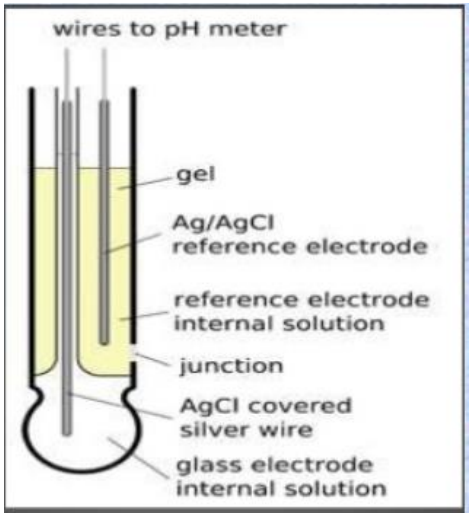

Figure : Combination gel electrode

pH Meter Calibration:

To be certain of accurate and reliable measurements, you need to perform pH meter calibration. This is generally done by measuring different buffer solutions with standardized, well-defined values, and then adjusting the pH meter based on any deviations from the buffer's known pH value.

Why is it necessary?

Changing Characteristics – Over time, aging and coating of pH electrodes can cause changes in their characteristics, and even the most stable electrodes cannot be produced with exactly the same characteristics.

Higher Accuracy – A minimum of three standards are required for a calibration curve, and a pH meter cannot be calibrated without a standardized buffer. If pH meter calibration has not been performed properly, the resulting measurements are likely to be inaccurate.

Reduced Drift – Measurement drift is a common issue with pH meters, as with any other instruments using electrodes. While drift from calibrated settings can't be eliminated or prevented, regular equipment calibration helps you maintain accuracy in measurement results.

Sample Differences – Multiple samples of the same substance can have different characteristics, and calibrating pH meters against standardized buffers helps to prevent membrane-related issues such as differences in ionic strength.

Procedure for calibration of the p^H meter:

1. Remove the pH meter probe from the pH 4 standard storage solution.

2. Rinse the probe with a gentle stream of distilled water.

3. Remove any excess liquid from the probe tip.

ACIDIC

4. Place the probe in the pH 7 Standard Solution.

5. Adjust the meter to read a pH of 7.0.

6. Remove the probe from the solution, rinse the probe with a gentle stream of distilled water, and remove any excess liquid from the probe tip

7. Place the probe in the pH 4 Standard Solution.

8. Adjust the meter to read a pH of 4.0

BASIC

10. Place the probe in the pH 7 Standard Solution.

11. Adjust the meter to read a pH of 7.0.

12. Remove the probe from the solution, rinse the probe with a gentle stream of distilled water, and remove any excess liquid from the probe tip.

13. Place the probe in the pH 10 Standard Solution.

14. Adjust the meter to read a pH of 10.0.

15. Now, the pH meter is calibrated.

Measuring the pH of a sample solution

1. Rinse the probe with a gentle stream of distilled water and remove any excess liquid from the probe.

2. Place the probe into the solution

3. Use the meter to measure the pH of the solution.

4. Record the measured pH.