

Determination of pH values

Aim: To determine the pH value of the given solutions namely washing soda, lemon juice, vinegar, milk, tomato juice, tap water, etc

Apparatus required: 5 droppers, test tubes, test-tube stand, and glazed tile.

Chemicals required: Universal indicator paper, distilled water, washing soda, vinegar, lemon juice, milk, tomato juice, tap water.

Theory: The pH value of a solution is defined as the negative logarithm of hydronium ion concentration in mol/L.

$$\text{pH} = -\log [\text{H}^+]$$

If the hydronium ion concentration is 1×10^{-7} mol/L, it may be stated that its pH is 7 and the solution is neutral solution.

Pure water $[\text{H}_3\text{O}^+] = 1 \times 10^{-7}$ mol/L

Therefore, the pH = 7

The pH of an acidic solution is below 7

The pH of a basic solution is above 7

Since $[\text{OH}^-] = 1 \times 10^{-14}$

Therefore, Hydroxide ion concentration can vary from 1×10^{-7} to 1×10^{-14} and Hydronium ion concentration can vary from 1×10^{-1} to 1×10^{-7} .

Thus pH values vary from 1 to 14. This is known as pH scale.

Procedure:

1. Prepare solutions in small quantities of lemon juice, milk, tomato juice etc.
2. Take the solution of the sample and arrange them on a test tube stand.
3. Place a drop of the test solution on the indicator paper with the help of a dropper.
4. Observe the colour produced and compare it with the colour on the chart.
5. Read the pH value from the chart given against the colour obtained on the indicator paper.
6. Repeat the experiment with other solutions.

pH Scale

| | | | | | | | | | | | | | | | |
|---|-----------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| [H ₃ O ⁺] Mol/L | 10 ⁰ | 10 ⁻¹ | 10 ⁻² | 10 ⁻³ | 10 ⁻⁴ | 10 ⁻⁵ | 10 ⁻⁶ | 10 ⁻⁷ | 10 ⁻⁸ | 10 ⁻⁹ | 10 ⁻¹⁰ | 10 ⁻¹¹ | 10 ⁻¹² | 10 ⁻¹³ | 10 ⁻¹⁴ |
| pH | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| | | | | | | | | Neutral | | | | | | | |
| | Acidic | | | | | | | Basic | | | | | | | |

Observation Table

With pH paper

| Sr. No. | Sample of Solution | Shade of Colour | pH | Acidic, Basic or Neutral |
|---------|--------------------|-----------------|----|--------------------------|
| 1 | Vinegar | | | |
| 2 | Tomato Juice | | | |
| 3 | Lemon Juice | | | |
| 4 | Milk | | | |
| 5 | Tap water | | | |
| 6 | Washing soda | | | |

With universal indicator

| Sr. No. | Sample of Solution | Shade of Colour | pH | Acidic, Basic or Neutral |
|---------|--------------------|-----------------|----|--------------------------|
| 1 | Vinegar | | | |
| 2 | Tomato Juice | | | |
| 3 | Lemon Juice | | | |
| 4 | Milk | | | |
| 5 | Tap water | | | |
| 6 | Washing soda | | | |

Result:

The sample of solution _____, _____ are acidic, sample _____ and _____ are basic, and the _____ sample is neutral.

Note: **for more details refer to** <http://www.elmhurst.edu/~chm/vchembook/184ph.html>