pH Concept

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1 Introduction

pH value is that value that tells us about the acidness or basicity of any material.

Mathematically, pH is the negative logarithm to the base 10 of the activity of hydronium ion, H^+.

as, $Activity(\alpha_{H^+}) = \frac{[H^+]}{mol\ L^{-1}}$

So, $pH = -log_{10}\,\alpha_{H^+} = -log_{10}\frac{[H^+]}{mol\ L^{-1}} = -log_{10}[H^+]$

There can be 3 types of solution

- Acidic
- Neutral
- Basic

At 298.15 K (25 ºC)

- $0 \leq pH(Acidic\ Solution) < 7$
- $pH(Neutral\ Solution) = 7$
- $14 \geq pH(Basic\ Solution) > 7$

2 Weak and Strong Acids and Bases

- pH of pure water = 7
- pH of acids < 7,
    - pH of weak acids = $\lim_{\varepsilon \to 0^+}(7 - \varepsilon)$
    - pH of strong acids = $\lim_{\delta \to 0^+}(0 + \delta)$
- pH of bases > 7,
    - pH of weak bases = $\lim_{\varepsilon \to 0^+}(7 + \varepsilon)$
    - pH of strong bases = $\lim_{\delta \to 0^+}(14 - \delta)$