Chemistry 20

Unit C: Solutions and acid-base chemistry

pH and pOH

Significant digits in meter readings

- pH 3.20 comes from a hydronium concentration of 6.3×10^{-4} $mol \cdot L^{-1}$.
- The SI unit on that concentration is $mol \cdot L^{-1}$, moles of solute per litre of solution.



Powers of ten, then the water sum

- A hydronium concentration of 1.0×10^{-3} mol·L^{-1} gives pH 3.00.
- A hydroxide concentration of 1.0×10^{-3} mol·L^{-1} gives pOH 3.00 and pH 11.00 at 25 °C, because pH + pOH = 14.00.

Key terms

hydronium concentration

The amount of H_3O+ in one litre of solution, written $[H_3O+]$ and measured in $mol \cdot L^{-1}$. ($[H_3O+]$)

pOH

The number $-\log[OH^-]$, where $[OH^-]$ is the hydroxide ion concentration in $mol \cdot L^{-1}$. ($pOH = -\log[OH^-]$)

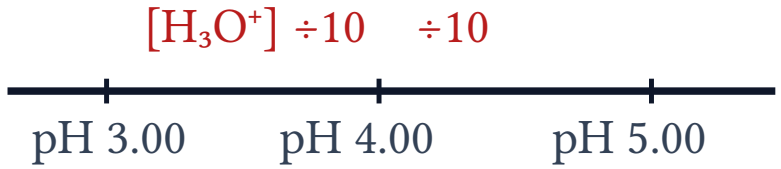
significant digits

The digits in a concentration that are fixed by how many decimal places the pH value shows. (pH 3.20)

Decimal places and a tenfold jump

- The number of decimal places in a pH value equals the significant digits in the concentration.
- A decrease of 1.00 in pH multiplies [H_3O+] by 10, and a decrease of 1.00 in pOH multiplies [OH^-] by 10.

pH decimals and ×10 jumps



2 decimals in pH ⟶ 2 sig figs in [H_3O^+]

Each +1 pH: [H_3O^+] is 10× smaller

From pH 3.20 back to mol·L^{-1}

- pH 3.20 has two decimal places, so the concentration has two significant digits.
- The matching hydronium concentration is 6.3×10^{-4} mol·L^{-1}.

A one-unit drop on the hydroxide scale

- At 25 °C, pOH 3.00 belongs with $[OH^-] = 1.0 \times 10^{-3}$ mol·L^{-1} and with pH 11.00.
- If that pOH decreases by 1.00, the hydroxide concentration is multiplied by 10.

Powers of ten

- Find the pH when $[H_3O^+] = 1.0 \times 10^{-3}\ \text{mol·L}^{-1}$.
- pH 3.20 allows two significant digits in $[H_3O^+]$, reported as $6.3 \times 10^{-4}\ \text{mol·L}^{-1}$.

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