

pH, pOH, [H⁺], [OH⁻] Worksheet

- 1) What is the [H⁺] for a one liter aqueous solution containing 5.73×10^{17} H⁺ ions?
- 2) A 0.23 M HClO₂ solution is 6.3% ionized. What is the [H⁺]?
- 3) What is the pH of a 0.034 M Ba(OH)₂ solution?
- 4) What is the hydroxide concentration in 2.7×10^{-3} M HCl?
- 5) Calculate the hydrogen ion concentration for an aqueous solution whose pOH is 8.37.

Solutions

1) $n_{\text{hyd}} = 5.73 \times 10^{17} \text{ H}^+$

$V = 1.00 \text{ L}$

$[\text{H}^+] = n/V$

$[\text{H}^+] = (5.73 \times 10^{17} \text{ H}^+ \times 1 \text{ mol H}^+ / (6.02 \times 10^{23} \text{ H}^+)) / 1.00 \text{ L}$

$[\text{H}^+] = 9.52 \times 10^{-7} \text{ M}$

2) $[\text{HClO}_2] = 0.23 \text{ M}$

$\% \text{ion} = 6.3\%$



$\% \text{ion} = [\text{H}^+] / [\text{HClO}_2] \times 100\%$

$[\text{H}^+] = 0.063 \times 0.23 \text{ M} = 1.4 \times 10^{-2} \text{ M}$

3) $[\text{Ba}(\text{OH})_2] = 0.034 \text{ M}$



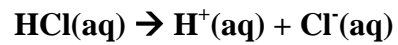
$[\text{OH}^-] = 0.034 \text{ mol Ba}(\text{OH})_2 / \text{L} \times 2 \text{ mol OH}^- / 1 \text{ mol Ba}(\text{OH})_2 = 0.068 \text{ M}$

$\text{pOH} = -\log[\text{OH}^-] = -\log[0.068] = 1.17$

$\text{pH} + \text{pOH} = 14.00$

$\text{pH} = 14.00 - \text{pOH} = 14.00 - 1.17 = 12.83$

4) $[\text{HCl}] = 2.7 \times 10^{-3} \text{ M}$



$$[\text{H}^{\text{+}}] = [\text{HCl}] = 2.7 \times 10^{-3} \text{ M}$$

$$K_{\text{w}} = [\text{H}^{\text{+}}] \times [\text{OH}^{-}] = 1.00 \times 10^{-14}$$

$$[\text{OH}^{-}] = K_{\text{w}}/[\text{H}^{\text{+}}] = (1.00 \times 10^{-14})/(2.7 \times 10^{-3}) = 3.7 \times 10^{-12} \text{ M}$$

5) $\text{pOH} = 8.37$

$$\text{pH} + \text{pOH} = 14.00$$

$$\text{pH} = 14.00 - \text{pOH} = 14.00 - 8.37 = 5.63$$

$$[\text{H}^{\text{+}}] = 10^{-\text{pH}} = 10^{-5.63} = 2.3 \times 10^{-6} \text{ M}$$