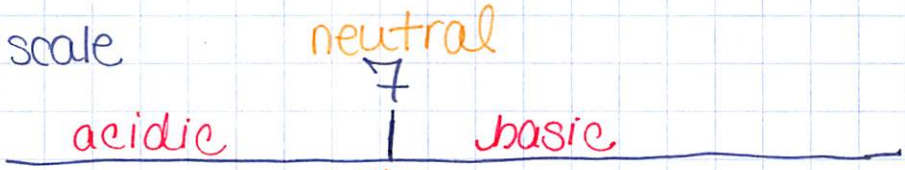
pH

- measure of the hydrogen ion (H^{1+}) or hydronium ion (H_3O^{1+}) concentration.

- pH scale



concentration in molarity

$pH = -\log[H^+]$ $\quad pOH = -\log[OH^-]$

pH & pOH do not have units

$$pH + pOH = 14.00$$

Ex) Calculate the pH and pOH of a 2.22×10^{-4} M HNO_3 solution. Is the solution acidic or basic?

HNO_3 = acid

$HNO_3(aq) \rightarrow H^{1+}(aq) + NO_3^{1-}(aq)$

2.22×10^{-4} M $\quad 2.22\times10^{-4}$ M

$pH = -\log[H^+]$

$= -\log(2.22\times10^{-4})$

$\boxed{pH = 3.65}$

$pH + pOH = 14.00$

$3.65 + pOH = 14.00$

$-3.65 \quad -3.65$

$\boxed{pOH = 10.35}$

Ex) Calculate the pH and pOH of a 4.44×10^{-10} M NaOH solution.

NaOH = base

$NaOH(aq) \rightarrow Na^{1+}(aq) + OH^{1-}(aq)$

4.44×10^{-10} M $\quad 4.44\times10^{-10}$ M

$pOH = -\log[OH^{1-}]$

$= -\log(4.44\times10^{-10}\text{ M})$

$\boxed{pOH = 9.35}$

$pH + pOH = 14.00$

$pH + 9.35 = 14.00$

$-9.35 \quad -9.35$

$\boxed{pH = 4.65}$

acidic

Ex) What is the pH and pOH of a 6.86×10^{-6} M H_2SO_4 solution?

acid

$H_2SO_4(aq) \rightarrow 2H^{1+}(aq) + SO_4^{2-}$

6.86×10^{-6} M

$2(6.86 \times 10^{-6}\text{M}) = 1.37 \times 10^{-5}$ M

$pH = -\log[H^+]$

$= -\log(1.37 \times 10^{-5})$

$\boxed{pH = 4.86}$

acidic

$pH + pOH = 14.00$

$4.86 + pOH = 14.00$

$-4.86 \quad -4.86$

$\boxed{pOH = 9.14}$

Neutralization

acid + base → salt + water

$\boxed{M_A V_A = M_B V_B}$

Ex) What volume of 0.00642M HBr solution is needed to neutralize 35.6mL of 0.00782M NaOH solution?

$M_A = .00642\text{M}$

$V_A = ?$

$M_B = .00782\text{M}$

$V_B = 35.6\text{mL} = .0356\text{L}$

$$\frac{(.00642\text{M})V_A}{.00642\text{M}} = \frac{(.00782\text{M})(.0356\text{L})}{.00642\text{M}}$$

$\boxed{V_A = .0434\text{L}}$