Chapter 15

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Acids and Bases

$K_w = [H_3O^+]\,[OH^-]$

$K_w = 1.0 \times 10^{-14}$

$pH = -\log [H_3O^+]$

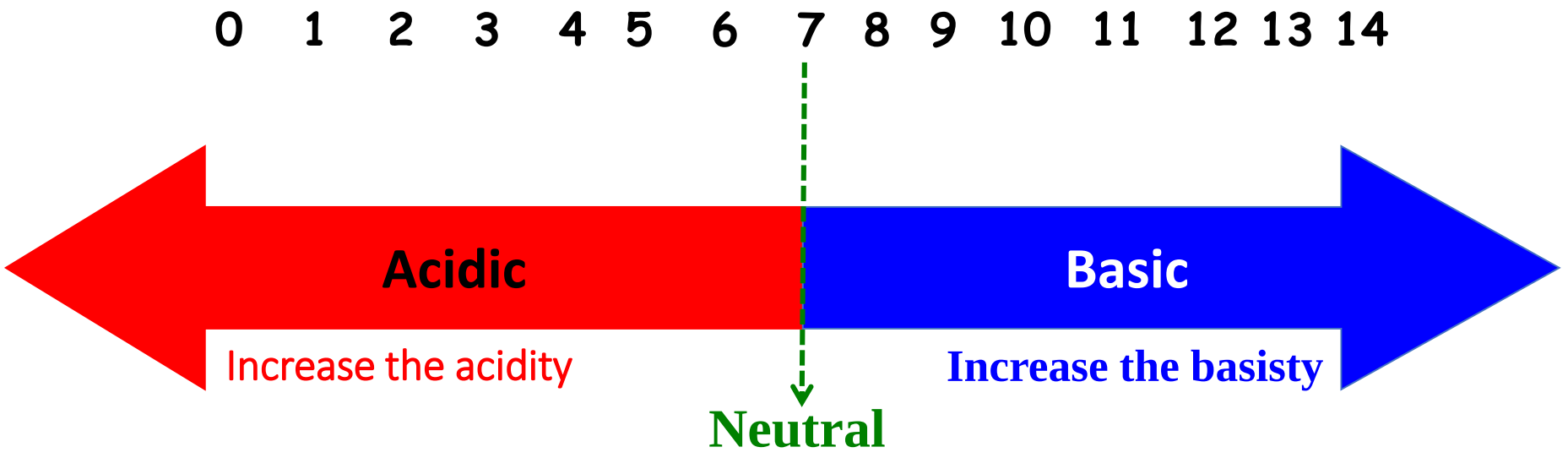
$[H_3O^+] = 10^{-pH}$

$pOH = -\log [OH^-]$

$[OH^-] = 10^{-pOH}$

$pH + pOH = 14$

pH Range



$[H^+]>[OH^-]$	$[H^+] = [OH^-]$	$[OH^-]>[H^+]$
pH < 7	pH = pOH = 7	pH >7

What is the H^+ concentration and pH of (0.005 M) HCl solution ?

$[H^+]=0.005$

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

$= -\log(0.005) = 2.3$

In the calculator:

(-) + log button + value (= 0.005) + equal button

What is the pH of (2. 3x10^{-5} M) NaOH solution?

$[OH^-] = 2.3x10^{-5}$

$$pOH = -\log[HO^-] = -\log(2.3\times10^{-5}) = 4.6$$

$$pH + pOH = 14$$

$$pH = 14 - pOH = 14 - 4.6 = 9.3$$

OR

$$K_w = [OH^-][H^+] = 1x10^{-14}$$

$$[H^+] = \frac{1x10^{-14}}{[HO^-]} = \frac{1x10^{-14}}{2.3x10^{-5}} = 4.3x10^{-10}$$

$$pH = -\log[H^+] = -\log(4.3x10^{-10}) = 9.3$$

What is the $[H^+]$ of a solution has pH= 3.3 ?

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

$$[H^+] = 10^{-pH}$$

$$[H^+] = 10^{-3.3} = 0.0005 = 5x10^{-4}\,M$$

In the calculator:

Press SHEFT + log button + (-ve) value (= 3.3) + equal button

When $[H^+] = 1.0 \times 10^{-7}$ M in water at 25°C, then _____

A. pH = 1.

B. $[OH^-] = 1.0 \times 10^{7}$ M.

C. $pH = 10^{-7}$

D. $[OH^-] = 1.0 \times 10^{-7}$ M

When $[H^+] = 4.0 \times 10^{-9}$ M in water at 25°C, then _____

A. pH = 9.40.

B. pH = 8.40.

C. pH = 7.00.

D. pH = –8.40.

A solution with a pOH of 4.3 has a $[H^+]$ of _____

A. 6.8×10^{-9} M.

B. 2.0×10^{-10} M.

C. 3.2×10^{-4} M.

D. 4.3 M.

A solution with an $[OH^-]$ concentration of 1.20×10^{-7} M has a pOH and pH of _____

A. 6.92 and 7.08

B. 7.08 and 6.92

C. 1.00 and 13.00

D. 5.94 and 8.06