Answer on question #56449 - Chemistry - General Chemistry

Question:

Determine whether the following hydroxide ion concentrations ([OH−]) correspond to acidic, basic, or neutral solutions by estimating their corresponding hydronium ion concentrations ([H3O+] using the ion product constant of water (Kw).

**It may help to keep the following equation in mind as you work

Kw = [H3O+][OH−] = [1×10−7 M][1×10−7 M] = 1×10−14 M

Question is: Which are acidic, neutral or basic?

[OH-]=10x10^-12M

[OH-]=7x10^-9M

[OH-]=7x10^-4M

[OH-]=8X10^-10M

[OH-]=1X10^-5M

[OH-]=4X10^-13M

[OH-]=1X10^-7M

[OH-]=2X10^-2M

Solution:

If $[OH^-]=10x10^{-12}$M then $[H_3O^+] = 10^{-14}/ 10x10^{-12} = 10^{-3}$ M, pH = $-lg[H_3O^+] = 3.00$, acidic solution

If $[OH^-]=7x10^{-9}$M then $[H_3O^+] = 10^{-14}/ 7x10^{-9} = 14.29x10^{-7}$ M, pH = $-lg[H_3O^+] = 5.84$, acidic solution

If $[OH^-]=7x10^{-4}$M then $[H_3O^+] = 10^{-14}/ 7x10^{-4} = 14.29x10^{-12}$ M, pH = $-lg[H_3O^+] = 10.85$, basic solution

If $[OH^-]=8X10^{-10}$M then $[H_3O^+] = 10^{-14}/ 8x10^{-10} = 1.25x10^{-5}$ M, pH = $-lg[H_3O^+] = 4.90$, acidic solution

If $[OH^-]=1X10^{-5}$M then $[H_3O^+] = 10^{-14}/ 1x10^{-5} = 1.00x10^{-9}$ M, pH = $-lg[H_3O^+] = 9.00$, basic solution

If $[OH^-]=4X10^{-13}$M then $[H_3O^+] = 10^{-14}/ 4x10^{-13} = 2.50x10^{-2}$ M, pH = $-lg[H_3O^+] = 1.60$, acidic solution

If $[OH^-]=1X10^{-7}$M then $[H_3O^+] = 10^{-14}/ 1x10^{-7} = 1.00x10^{-7}$ M, pH = $-lg[H_3O^+] = 7.00$, neutral solution

If $[OH^-]=2X10^{-2}$M then $[H_3O^+] = 10^{-14}/ 2x10^{-2} = 5.00x10^{-13}$ M, pH = $-lg[H_3O^+] = 12.30$, basic solution

Answer:

$[OH^-]=10x10^{-12}$M acidic solution

$[OH^-]=7x10^{-9}$M acidic solution

$[OH^-]=7x10^{-4}$M basic solution

$[OH^-]=8X10^{-10}$M acidic solution

$[OH^-]=1X10^{-5}$M basic solution

$[OH^-]=4X10^{-13}$M acidic solution

$[OH^-]=1X10^{-7}$M neutral solution

$[OH^-]=2X10^{-2}$M basic solution