$K_w = [H^+][OH^-]$

Acid and Bases pH and pOH

Complete the following:

What is pH, with example?

a measure of the acidity or alkalinity of a solution

*ranges from 0-14

What is pOH, with example?

a measure of the hydroxide ($[OH^-]$) ion concentration

What is K_w and how is it used?

* $K_w = 1 \times 10^{-14}$; ionization constant for water

* $K_w = [H^+][OH^-]$

Calculate the H^+ concentration in each of the following solutions, and indicate whether the solution is acidic, basic, or neutral.

pH Scale

acidic - less than 7

basic - greater than 7

neutral = 7

1) $[OH^-] = 3.99 \times 10^{-5}$ M — $\frac{1 \times 10^{-14}}{3.99 \times 10^{-5}} = 2.51 \times 10^{-10}$ — B

2) $[OH^-] = 2.91 \times 10^{-9}$ M — $\frac{1 \times 10^{-14}}{2.91 \times 10^{-9}} = 3.44 \times 10^{-6}$ — A

3) $[OH^-] = 7.23 \times 10^{-2}$ M — $\frac{1 \times 10^{-14}}{7.23 \times 10^{-2}} = 1.38 \times 10^{-13}$ — B

4) $[OH^-] = 9.11 \times 10^{-7}$ M — $\frac{1 \times 10^{-14}}{9.11 \times 10^{-7}}$ 1.10×10^{-8} — B

$[H^+] = \frac{K_w}{[OH^-]}$

Calculate the OH- concentration [OH-] in each of the following solutions, and indicate whether the solution is acidic, basic, or neutral.

1) $[H^+] = 1.00 \times 10^{-7}$ M — $\frac{1 \times 10^{-14}}{1 \times 10^{-7}}$ 1×10^{-7} — N

2) $[H^+] = 7.00 \times 10^{-7}$ M — $\frac{1 \times 10^{-14}}{7 \times 10^{-7}}$ 1.43×10^{-8} — A

3) $[H^+] = 7.00 \times 10^{-1}$ M — $\frac{1 \times 10^{-14}}{7 \times 10^{-1}}$ 1.43×10^{-14} — A

$[OH^-] = \frac{K_w}{[H^+]}$

Calculate the pH corresponding to each of the H^+ ion concentrations given below. Tell whether each solution is acidic, basic, or neutral.

1) $[H^+] = .00100$ M $-\log[.00100] = 3.00$ A

2) $[H^+] = 2.19 \times 10^{-4}$ M $-\log[2.19\times10^{-4}] = 3.66$ A

3) $[H^+] = 9.18 \times 10^{-11}$ M $-\log[9.18\times10^{-11}] = 10.0$ B

4) $[H^+] = 4.71 \times 10^{-7}$ M $-\log[4.71\times10^{-7}] = 6.33$ A

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

Calculate the pH corresponding to each of the hydroxide ion concentrations given below. Tell whether each solution is acidic, basic, or neutral.

1) $[OH^-] = 1.00 \times 10^{-7}$ M $-\log[1.00\times10^{-7}] = 7$ $pH = 14-7=7 \rightarrow N$

2) $[OH^-] = 4.59 \times 10^{-13}$ M $-\log[4.59\times10^{-13}] = 12.3$ $pH = 14-12.3 = 1.66 \rightarrow A$

3) $[OH^-] = 1.04 \times 10^{-4}$ M $-\log[1.04\times10^{-4}] = 3.98$ $pH = 14-3.98 = 10.0 \rightarrow B$

4) $[OH^-] = 7.00 \times 10^{-1}$ M $-\log[7.00\times10^{-1}] = .155$ $pH = 14-1.55 = 13.85 \rightarrow B$

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

$pH = 14 - pOH$

Calculate the pH corresponding to each of the pOH values given below. indicate whether each solution is acidic, basic, or neutral.

1) pOH = 4.32 $14-4.32 = 9.68$ B

2) pOH = 8.90 $14-8.90 = 5.1$ A

3) pOH = 1.81 $14-1.81 = 12.19$ B

4) pOH = 13.1 $14-13.1 = 0.9$ A

$pH = 14 - pOH$

Calculate the hydrogen ion concentration , in M, for the following pH values.

1) pH = 1.04 $10^{-1.04} = 0.09$ A

2) pH = 13.1 $10^{-13.1} = 7.94\times10^{-14}$ B

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

* $-\log[K_w] = 14$ $pH + pOH$