Success 24/7 Chemistry: pH, pOH, $[H^+]$, & $[OH^-]$ Calculations

The pH is a scale to indicate how many hydrogen ions are present in a solution. The letters represent the French words "pouvoir hydrogene" which mean hydrogen power.

pH < 7 : Acid

pH > 7 : Base

pH = 7 : Neutral

$$\mathbf{pH = -\log[H^+]}$$

Examples:

$[H^+] = 4.5 \times 10^{-5}$
pH = _____
Acid or Base? _____

What is the pH of a 0.00048 M solution of HCl?

You can calculate the hydrogen ion concentration if you are given the pH.

$$\mathbf{[H^+] = antilog\ (-pH)}$$

(looks like 10^{-pH} in your calculator)

Example:

pH = 8.29
$[H^+]$ = _____
Acid or Base? _____

There is also a pOH scale. This scale indicates how many hydroxide ions are present in a solution.

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

Examples:

$[OH^-] = 2.8 \times 10^{-3}$
pOH = _____
Acid or Base? _____

What is the pOH of a 2.8×10^{-5} M solution of NaOH?

You can calculate the hydroxide ion concentration if you are given pOH.

$[OH^-]$ = antilog(-pOH)

(looks like 10^{-pOH} in your calculator)

Example:

pOH = 9.32

$[OH^-]$ = _____

Acid or Base? _____

Equations so far:

What you are looking for:		What you are given:
pH	=	-log$[H^+]$
$[H^+]$	=	antilog (-pH)
pOH	=	-log $[OH^-]$
$[OH^-]$	=	antilog(-POH)

There are 2 equations that can be used to go between the hydrogen scale and hydroxide scale.

pH + pOH = 14

$[H^+][OH^-] = 1.0 \times 10^{-14}$

Examples:

pH = 2.54

pOH = _____

Acid or Base? _____

The concentration of a HCl solution is 0.00054 M. What is the hydroxide ion concentration?

pH = 3.27

$[OH^-]$ = _____

Acid or Base? _____

Practice:

1. Calculate the pH of each of the following solutions:

a. 3.05×10^{-3} M HNO_3

b. 0.620 M KOH

c. 0.0558 M $Ba(OH)_2$

2. What is the concentration of H_3O^+ ions in a solution with a pH of 9.28?

3. What is the hydrogen ion concentration of a substance that has a hydroxide ion concentration of 3.8×10^{-3}?