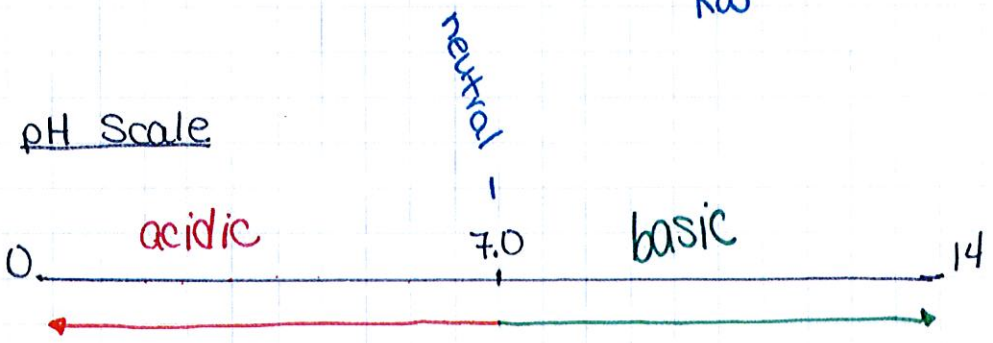
pH - potential of hydrogen, measure of the concentration of H^+ ions in an acid or base.

concentration of H^+ (M) — concentration of OH^- (M)

$$[H^+] \times [OH^-] = 1.00 \times 10^{-14}$$

K_w



pH of Common Substances

pH	$[H^+]$	Substance
0	1×10^{0} M	battery acid
1.0	1×10^{-1} M	stomach acid (HCl)
2.0	1×10^{-2} M	lemon juice, vinegar
3.0	1×10^{-3} M	grapefruit, orange juice, soda
4.0	1×10^{-4} M	tomato juice, acid rain
5.0	1×10^{-5} M	soft drinking water, black coffee
6.0	1×10^{-6} M	urine, saliva
7.0	1×10^{-7} M	"pure" H_2O
8.0	1×10^{-8} M	seawater
9.0	1×10^{-9} M	baking soda ($NaHCO_3$)
10.0	1×10^{-10} M	Great Salt Lake, milk of magnesia
11.0	1×10^{-11} M	ammonia
12.0	1×10^{-12} M	soapy water
13.0	1×10^{-13} M	bleach, oven cleaner
14.0	1×10^{-14} M	drain cleaner

Calculating pH

These are the equations you will use

(A) $pH = -\log[H^+]$

(B) $pOH = -\log[OH^-]$

(C) $pH + pOH = 14.0$

(D) $[H^+] \times [OH^-] = 1.00 \times 10^{-14}$

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

(F) $[OH^-] = 10^{-pOH}$

Ex) Calculate the pH of HNO_3 with a concentration of $[H^+] = 1.50 \times 10^{-4}$ M.

$HNO_3 \rightarrow H^+ + NO_3^-$

$pH = -\log[H^+] = -\log(1.50 \times 10^{-4})$

$pH = 3.82$

Ex) Calculate the pOH of $Ca(OH)_2$ with a concentration of $2(7.35 \times 10^{-6}$ M)

$Ca(OH)_2 \rightarrow Ca^{2+} + 2OH^-$

$[OH^-] = 2(7.35 \times 10^{-6}\ M)$

$[OH^-] = 1.47 \times 10^{-5}$ M

$pOH = -\log[OH^-] = -\log(1.47 \times 10^{-5})$

$pOH = 4.83$

Ex) Calculate the pOH of HBr with a concentration of 8.41×10^{-9} M.

$HBr \rightarrow H^+ + Br^-$

$[H^+] = 8.41 \times 10^{-9}$ M

$pH = -\log[H^+] = -\log(8.41 \times 10^{-9}) = 8.08$

$pH + pOH = 14.0$

$8.08 + pOH = 14.0$

$-8.08 \quad -8.08$

$pOH = 5.92$