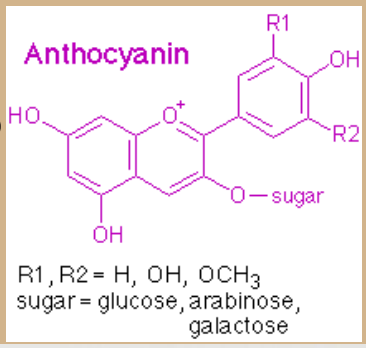
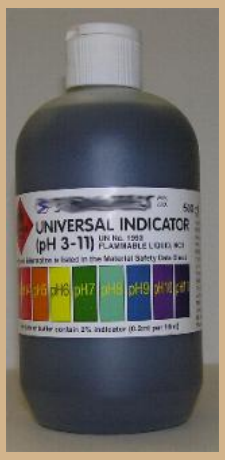
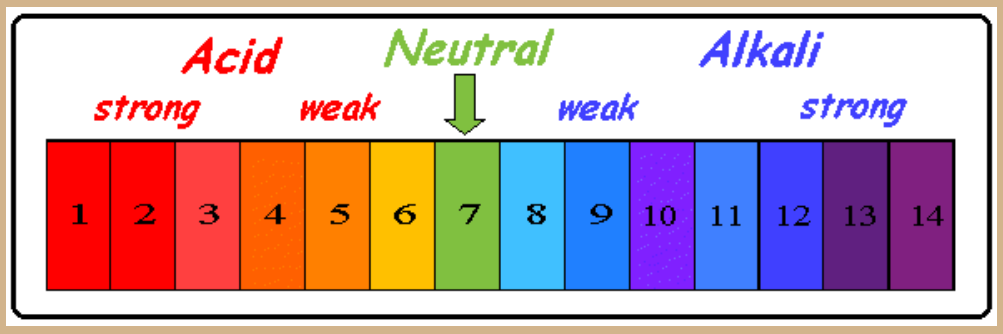
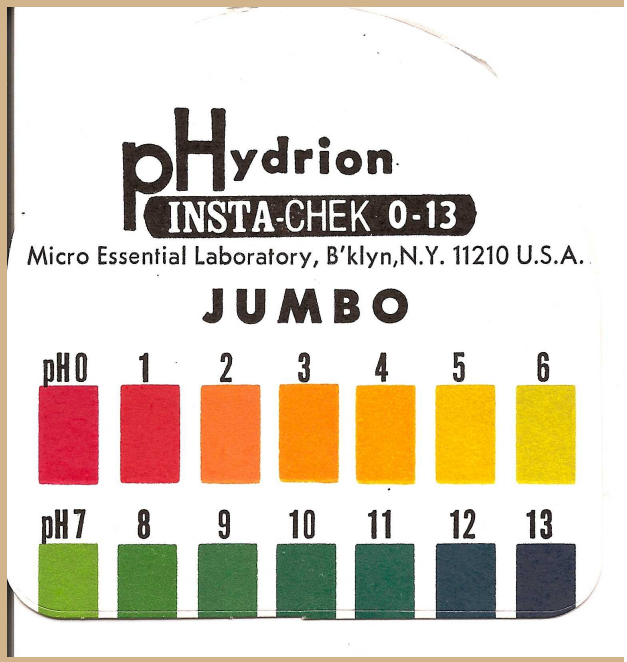
pH Relationships









pH & pOH Scales

pH

0 ⟷ 7 ⟷ 14

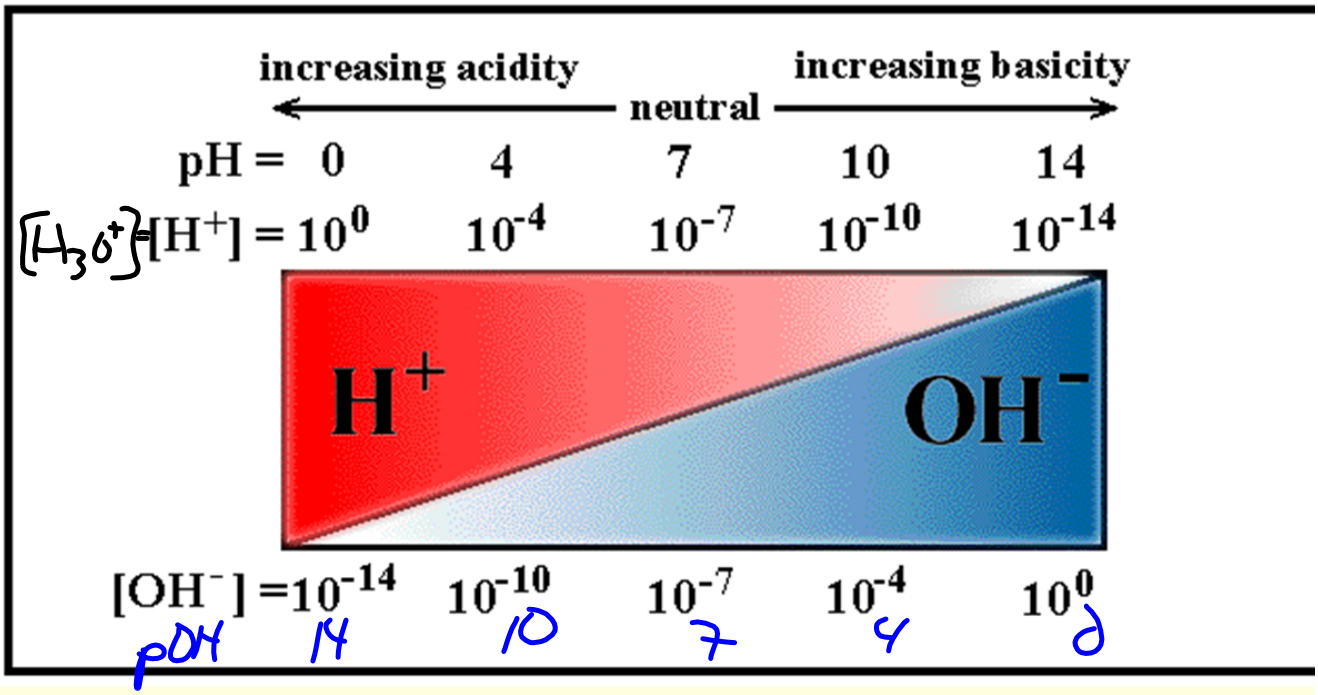
Acid Basic

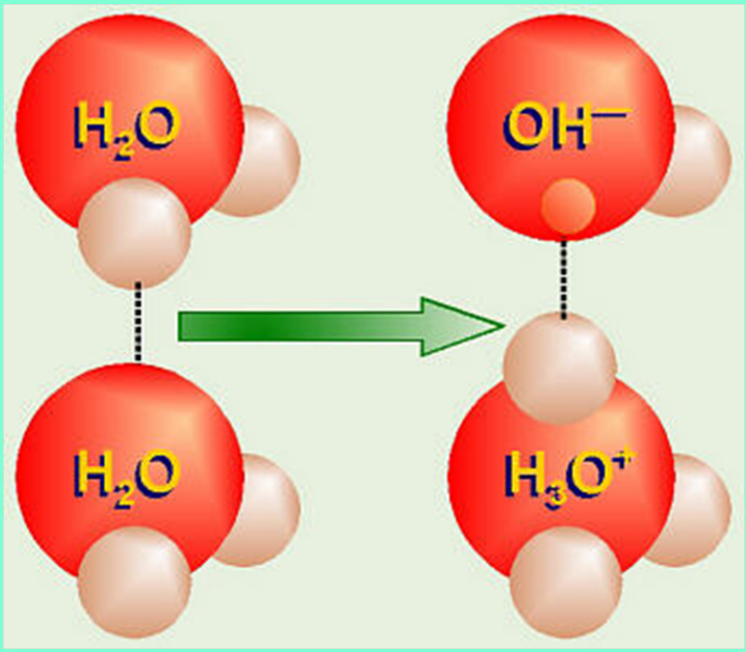
pOH

14 ⟷ 7 ⟷ 0

neutral

Notice: H^+ and OH^- ions present are present in all solutions, including both acidic and basic





Pure water, neutral solution

$$2\ H_2O \rightleftharpoons H_3O^{+1} + OH^{-1}$$

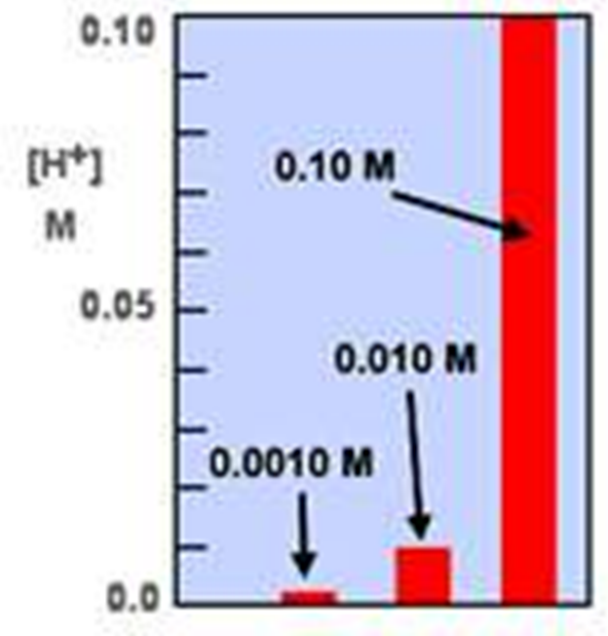
0.0000001 M = 0.0000001 M

$10^{-7} = 10^{-7}$

calculations:

- $pH = -\log[H_3O^{+1}] = -\log(10^{-7}) = 10^{\log(EE-7)} = 7$
- $pOH = -\log[OH^{-1}]$
- $[H_3O^{+1}] \cdot [OH^{-1}] = 1 \times 10^{-14}$
- $pH + pOH = 14$

What does this all mean?



- pH = 1 = 0.1 M
- pH = 2 = 0.01 M
- pH = 3 = 0.001M
- Each pH unit changes by 10 fold (logarithmic)

Acidity and pH

	pH	$[H_3O^+]$	M
Strongly acidic	1	10^{-1}	0.1
	2	10^{-2}	0.01
	3	10^{-3}	0.001
	4	10^{-4}	0.0001
	5	10^{-5}	0.00001
Weakly Acidic	6	10^{-6}	0.000001
Neutral	7	10^{-7}	0.0000001
Weakly Basic	8	10^{-8}	0.00000001
	9	10^{-9}	0.000000001
	10	10^{-10}	0.0000000001
	11	10^{-11}	0.00000000001
	12	10^{-12}	0.000000000001
	13	10^{-13}	0.0000000000001
Strongly basic	14	10^{-14}	0.00000000000001

Why do we use pH System?

In testing the acidity of your swimming pool, what is easier to understand?

- $[H_3O^+]$ of 0.0000001Mol/L
- OR…….pH of 7

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pH + pOH = 14

$pH = -\log[H_3O^{+1}]$

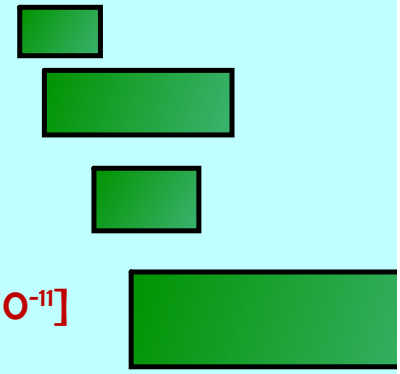
$pOH = -\log[OH^{-1}]$

If the pH is 3, then the pOH is 11

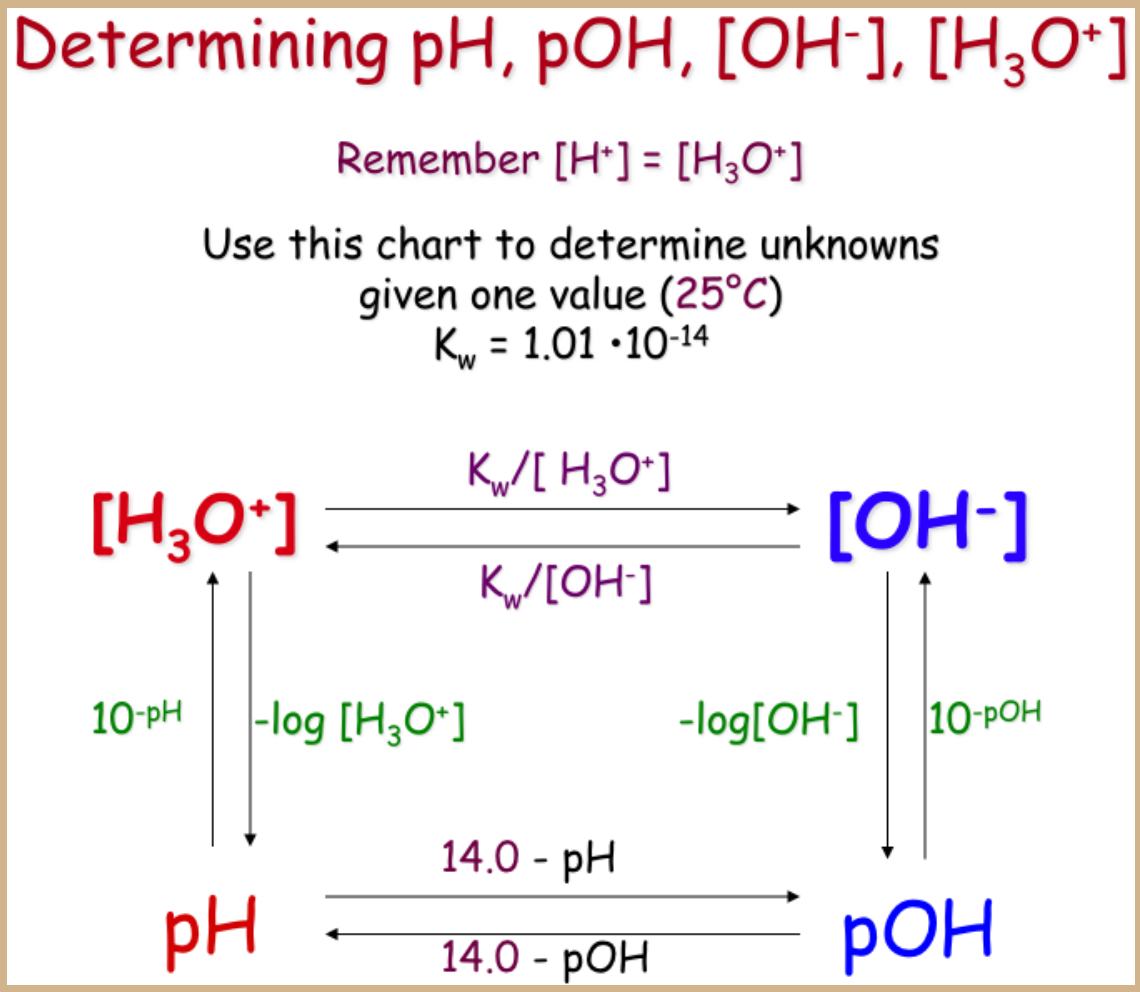
14 - 3 = 11

then the $[OH^-]$ is 10^{-11}

$11 = -\log[10^{-11}]$



Acid Base Calculations



It is possible to have a pH/pOH greater then 14 or less then 0?

Only mathematecally (pH= 15 or pH = -1)

$$pH = -\log[H_3O^{+1}]$$

$$pOH = -\log[OH^{-1}]$$

- pOH = 7 pH = 7
- pOH = 10 pH = 4
- $[OH^-] = 1.0 \times 10^{-7}M$ pH = 7
- [H+] = 1.0E-4M pH = 4

- pH = 7 $[OH^-] = 1.0E-7M$
- pOH = 7 $[OH^-] = 1.0E-7M$
- $[H^+] = 1.0E-4M$ $[OH^-] = 1.0E-10M$
- $[H^+] = 1.0E-10M$ $[OH^-] = 1.0E-4M$