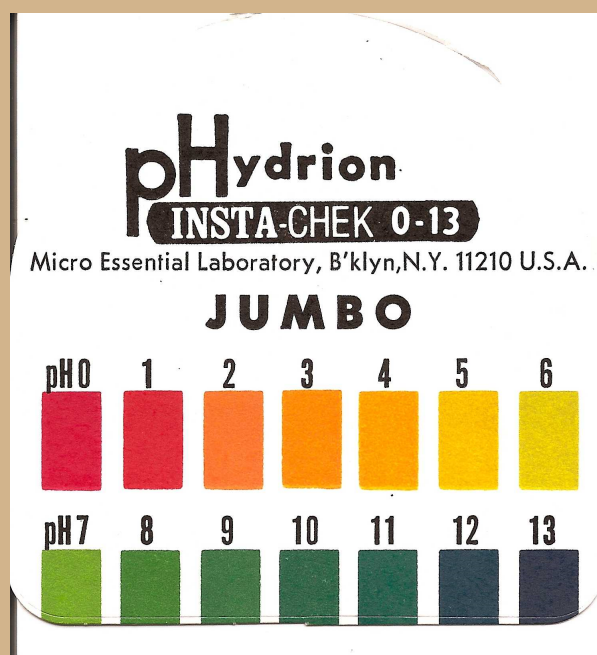
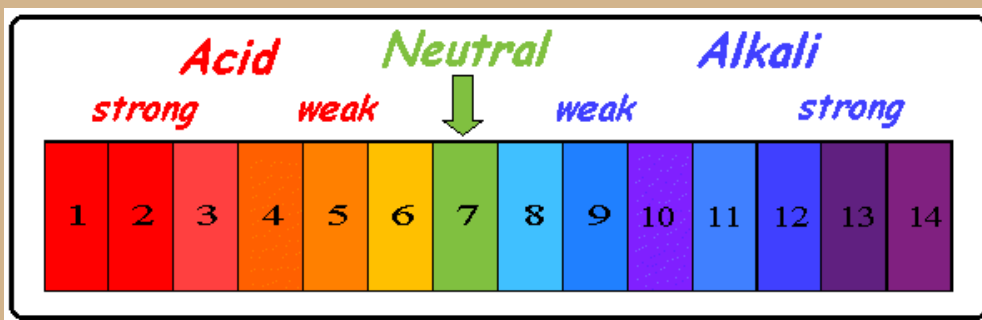
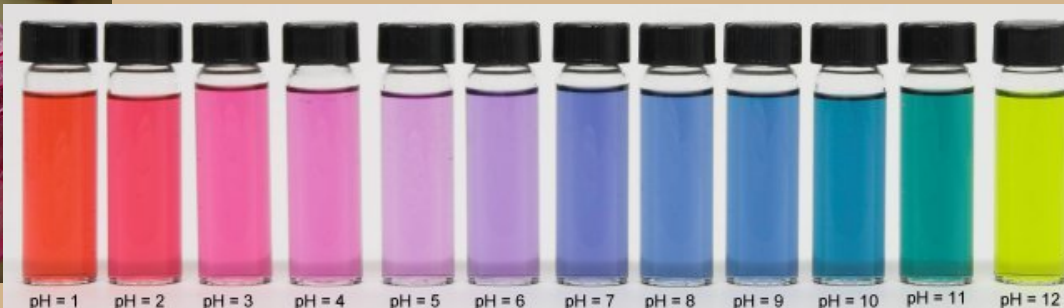
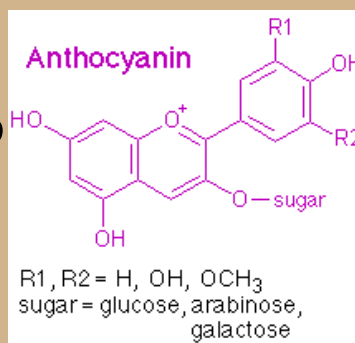
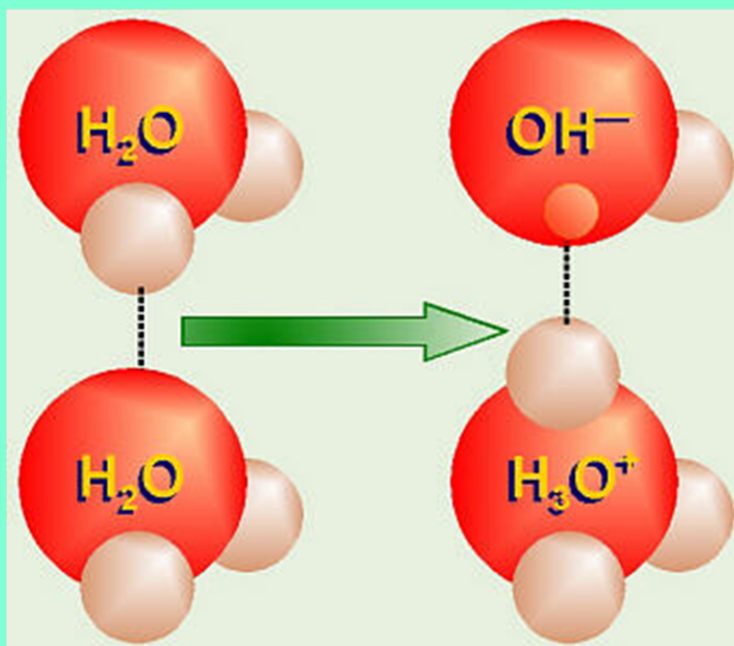


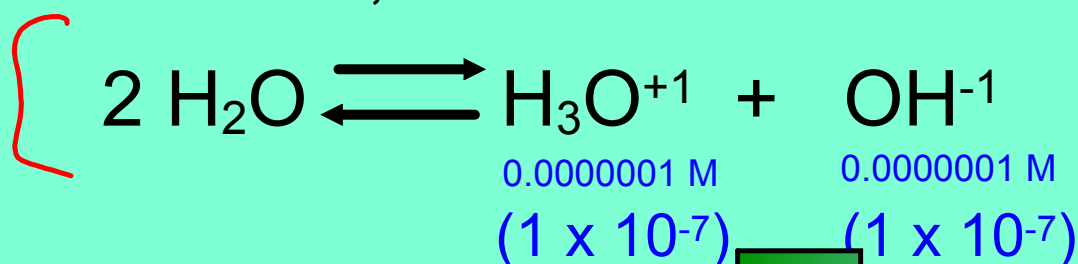
# pH Relationships







Pure water, neutral solution



calculations:

$$\text{pH} = -\log[\text{H}_3\text{O}^{+1}] = 7 \quad = -\log(1 \times 10^{-7})$$

$$\text{pOH} = -\log[\text{OH}^{-1}] = 7 \quad = -\log(1 \times 10^{-7})$$

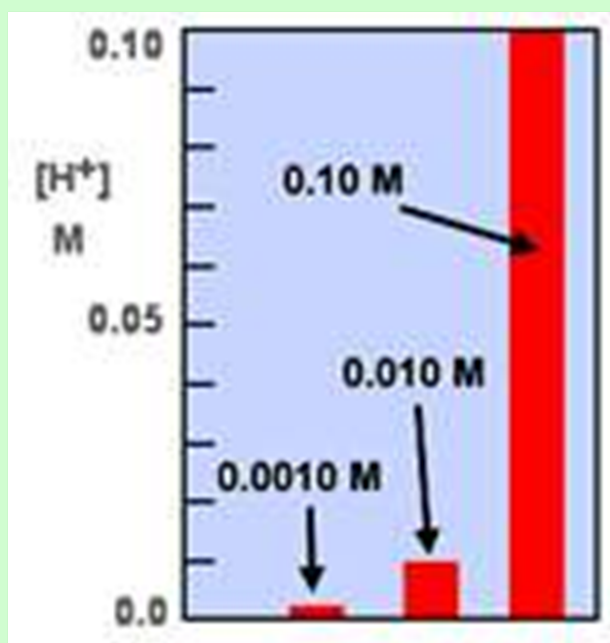
$$[\text{H}_3\text{O}^{+1}] \cdot [\text{OH}^{-1}] = 1 \times 10^{-14}$$

$$(1 \times 10^{-7})(1 \times 10^{-7}) = (1 \times 10^{-14})$$

$$\text{pH} + \text{pOH} = 14$$

$$7 + 7 = 14$$

What does this all mean?



- $\text{pH} = 1 = 0.1 \text{ M}$
- $\text{pH} = 2 = 0.01 \text{ M}$
- $\text{pH} = 3 = 0.001 \text{ M}$

Each pH unit changes by 10 fold (logarithmic)

## Acidity and pH

	pH	$[\text{H}_3\text{O}^+]$	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	$10^{-14}$

## Why do we use pH System?

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

- $[\text{H}_3\text{O}^+]$  of 0.0000001 Mol/L
- OR.....pH of 7

$$\text{pH} + \text{pOH} = 14$$

$$[\text{H}_3\text{O}^{+1}] [\text{OH}^{-1}] = 1 \times 10^{-14}$$

$$\text{pH} = -\log[\text{H}_3\text{O}^{+1}]$$

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

$$[\text{H}_3\text{O}^{+1}] = 0.001\text{M}$$

$$\text{pH} = -\log[\text{H}_3\text{O}^{+1}] = 3$$

0.001



If the pH is 3, then the pOH is

11



$$14 - 3 = 11$$



~~[0.001]~~

0.001

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

$[\text{OH}^{-}] = 10^{-11}$

0.001

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

