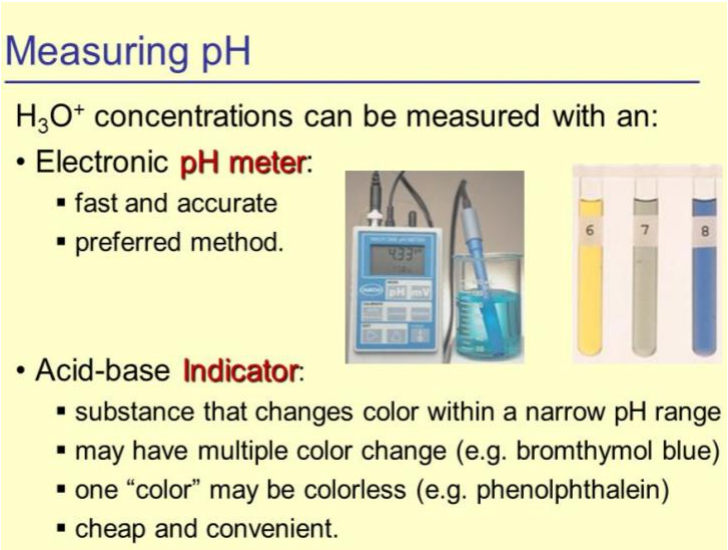
1. Acid Vs. Base

Type	Acid (HX)	Base (B or YOH)
Definition	A substance that produces H^+ ion in aqueous solution	A substance that captures H^+ ion or gives OH^- ion in aqueous solution.
Reaction in Aqueous solution (water)	$HX + H_2O \rightarrow H_3O^+ + X^-$	$B + H_2O \rightarrow BH^+ + OH^-$
Example	$HCl + H_2O \rightarrow H_3O^+ + Cl^-$ $HBr + H_2O \rightarrow H_3O^+ + Br^-$	$NaOH \rightarrow Na^+ + OH^-$ (in the presence of water) $NH_3 + H_2O \rightarrow NH_4^+ + OH^-$ ‘
pH	pH < 7	pH > 7
$[H_3O^+]$	$[H_3O^+] > 10^{-7}$	$[H_3O^+] < 10^{-7}$
$[OH^-]$	$[OH^-] < 10^{-7}$	$[OH^-] > 10^{-7}$
Color change with litmus paper	Red	Blue

2. What is pH and how it can be measured?

pH is the measurement of the hydrogen ion $[H^+]$ or hydronium ion concentration $[H_3O^+]$. Every aqueous solution can be measured to determine its pH value. This value ranges from 0 to 14.



3. Relation between concentration of hydronium ion ($[H_3O^+]$) and pH.

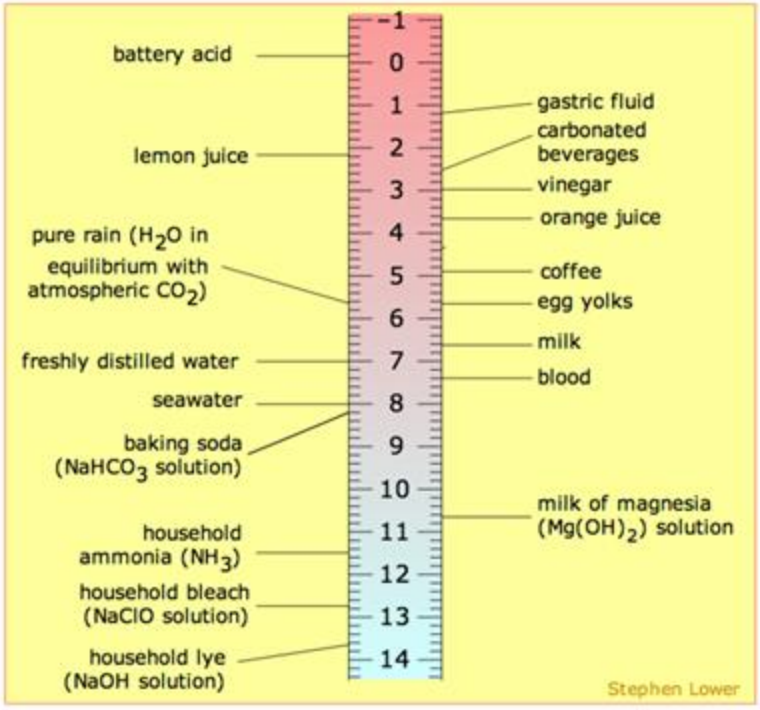
$[H_3O^+] = 10^{-pH}$ and $pH = -\log [H_3O^+]$

$Kw = [H_3O^+][OH^-] = 10^{-14}$

Example.

Ex 1: A solution has pH = 3.2.

1. Calculate the concentration of hydronium ion that is presented in the solution.
2. Deduce the concentration of hydroxide ion that is presented in the solution.



Ex 2: A solution contains hydronium ions of concentration 0.01 mol/l.

1. Calculate the pH of this solution.
2. Deduce the concentration of hydroxide ions.

Ex 3: use the figure.

1. Indicate the pH of rain.
2. Deduce the nature of rain.
3. Calculate the concentration of hydronium ion and hydroxide ion that are presented in rain water.
4. Knowing that the average volume of a rain drop is 1 mL.
   Calculate the number of moles of hydronium ion that is presented in a rain drop.

Ex 4: The concentration of hydroxide ion in an unknown solution is 1.258×10^{-6} mol/L

1. Use the figure to identify this solution.