Concentration of Hydrogen ions compared to distilled water		Examples of solutions at this pH
10,000,000	pH= 0	Battery acid, Strong Hydrofluoric Acid
1,000,000	pH = 1	Hydrochloric acid secreted by stomach lining
100,000	pH = 2	Lemon Juice, Gastric Acid Vineger
10,000	pH = 3	Grapefruit, Orange Juice, Soda
1,000	pH = 4	Acid rain Tomato Juice
100	pH = 5	Soft drinking water Black Coffee
10	pH = 6	Urine Saliva
1	pH = 7	"Pure" water
1/10	pH = 8	Sea water
1/100	pH = 9	Baking soda
1/1,000	pH = 10	Great Salt Lake Milk of Magnesia
1/10,000	pH = 11	Ammonia solution
1/100,000	pH = 12	Soapy water
1/1,000,000	pH =13	Bleaches Oven cleaner
1/10,000,000	pH = 14	Liquid drain cleaner

Concentration of Hydrogen ions compared to distilled water				Examples of solutions and their respective pH
	1/10,000,000	14	Liquid drain cleaner, Caustic soda	
	1/1,000,000	13	bleaches, oven cleaner	
	1/100,000	12	Soapy water	
	1/10,000	11	Household Ammonia (11.9)	
	1/1,000	10	Milk of magnesium (10.5)	
	1/100	9	Toothpaste (9.9)	
	1/10	8	Baking soda (8.4), Seawater, Eggs	
	0	7	"Pure" water (7)	
	10	6	Urine (6) Milk (6.6)	
	100	5	Acid rain (5.6) Black coffee (5)	
	1,000	4	Tomato juice (4.1)	
	10,000	3	Grapefruit & Orange juice, Soft drink	
	100,000	2	Lemon juice (2.3) Vinegar (2.9)	
	1,000,000	1	Hydrochloric acid secreted from the stomach lining (1)	
	10,000,000	0	Battery Acid	

Place the following substances where they belong on the pH scale:

McIntosh Apple	3.34
Bananas	5.00
Lemon	2.3
Eggs	7.8
Tea	7.20
Human Blood	7.40
Bread	5.60
Acid Rain	5.2
Cantaloupe	6.40
Parmesan Cheese	5.25
Lettuce	6.0
Milk	6.70
Watermelon	5.40
Wheates	5.10

pH and pOH Calculations

$pH = -\log [H_3O^+]$ $pOH = -\log [OH^-]$ $pH + pOH = 14$

$K_w = 1.00 \times 10^{-14} M^2 = [H_3O^+][OH^-]$

1. Calculate the pH of a solution that is 0.500 M H^+.

2. Calculate the pH of a solution that measures a pOH of 4.10.

3. A solution in a lab was tested with pH paper, which revealed the solution had a pH of 6.77. What is the concentration of hydrogen ion in the solution?

4. What is the pOH of a solution that is 0.00310 M H^+. (Be careful!!)

5. Determine the pH of a solution whose hydroxide ion concentration is 2.8×10^{-2}M.

pH and pOH Calculations

pH = -log [H_3O^+] **pOH = -log [OH^-]** **pH + pOH = 14**

$K_w = 1.0 \times 10^{-14} M^2 = [H_3O^+][OH^-]$

1. Calculate the pH of a solution that is 0.500 M H^+.

$pH = -\log [H_3O^+] = -\log [H^+]$

$= -\log (0.500 M) = 0.3010$

2. Calculate the pH of a solution that measures a pOH of 4.10.

$pH + pOH = 14$

$14 - pH = pOH$

$pOH = 14 - 4.10 = 9.90$

3. A solution in a lab was tested with pH paper, which revealed the solution had a pH of 6.77. What is the concentration of hydrogen ion in the solution?

$[H^+] = \text{Inverse log}(-pH)$

$= \text{Inverse log}(-6.77) = 1.7 \times 10^{-7} M\ H^+$

4. What is the pOH of a solution that is 0.00310 M H^+. (Be careful!!!)

$pH = -\log [H^+]$

$= -\log (0.00310 M) = 2.509$

$pH + pOH = 14$

$pOH = 14 - pH$

$= 14 - 2.509 = 11.491$

Could also use

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

$[OH^-] = \frac{1.0 \times 10^{-14} M^2}{0.00310 M}$

$= 3.23 \times 10^{-12} M$

$pOH = -\log [OH^-]$

$= 11.49$

5. Determine the pH of a solution whose hydroxide ion concentration is 2.8×10^{-2} M.

$pOH = -\log [OH^-]$

$= -\log (2.8 \times 10^{-2} M)$

$= 1.55$

$pH + pOH = 14$

$14 - 1.55 = pH = 12.45$

Could also use

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

$[H^+] = 3.6 \times 10^{-13} M$

$pH = -\log [H^+]$

$= 12.44$