

### RELATIONSHIP BETWEEN PH AND POH FOR ACIDS AND BASES

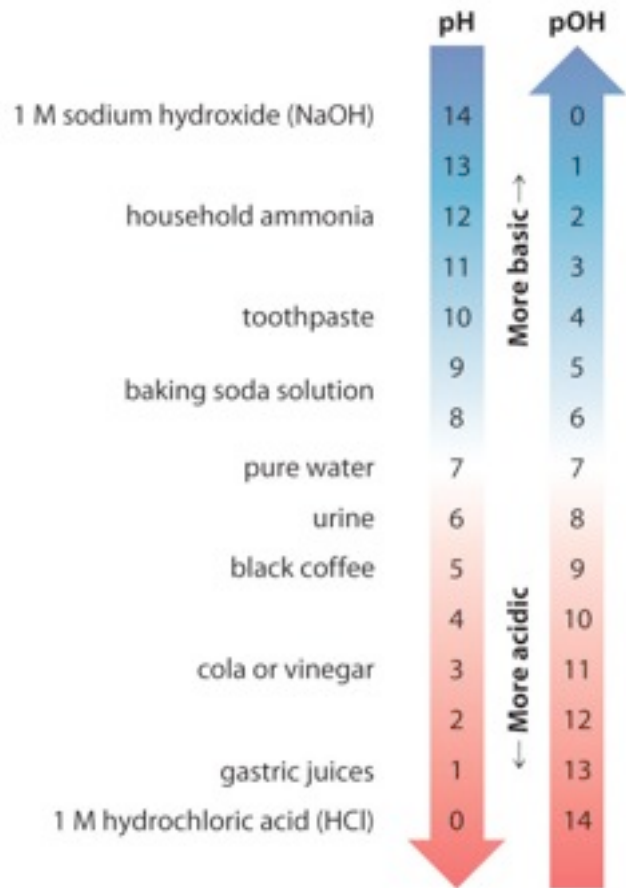
#### pH vs. pOH scale:

Both acids and bases can be measured using the pH or pOH scale. Both scales provide a measure of either the H<sup>+</sup> concentration or the OH<sup>-</sup> concentration.

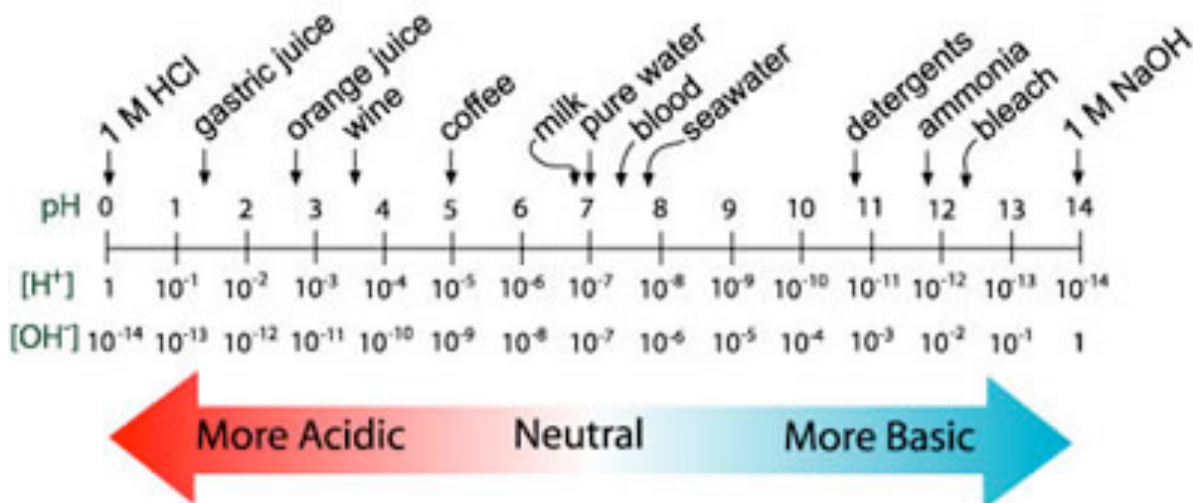
Notice that each scale shows where acids and bases both are located.

- When acids are measured, the pH is less than 7, but the pOH is greater than 7.
- When bases are measured, the pH is greater than 7, but the pOH is less than 7.

Both scales are dependent on what ion you are measuring.



#### [H<sup>+</sup>] vs. [OH<sup>-</sup>]:



pH and pOH are related to one another; **THEY ARE NOT INDEPENDENT OF EACH OTHER.** As pH increases, pOH decreases. As pH decreases, pOH increases. By knowing what ion you are measuring on which scale, this will tell you whether or not the solution is acidic or basic.

Ion Concentration	Solution Type	pH	pOH
$[H^+] > [OH^-]$	<b>Acidic</b>	$pH < 7$	$pOH > 7$
$[H^+] < [OH^-]$	<b>Basic</b>	$pH > 7$	$pOH < 7$
$[H^+] = [OH^-]$	<b>Neutral</b>	$pH = 7$	$pOH = 7$

Because these scales are related, an equation can be used to explain their correlation.

$$pH + pOH = 14$$

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$$pH = 14 - pOH$$

$$pOH = 14 - pH$$

\*The bottom equations are manipulations of the top equation\*

The **KEYS** to calculations are knowing:

1. Knowing what type of solution you are working with
2. What equation to use first

### Example Calculations:

#### 1. Calculate the pH and pOH of a 0.33 M H<sub>2</sub>SO<sub>4</sub> solution.

- Are you working with an acid or a base? \_\_\_\_\_
- Are you given the concentration, or *Molarity* of that solution? \_\_\_\_\_
- Next, plug the concentration or Molarity into the correct equation.

*Because this is an acidic solution, we have to calculate pH first.*

$$pH = -\log[0.33] = \underline{\hspace{2cm}}$$

*Now we can calculate the pOH, because we have calculated the pH.*

$$pOH = 14 - pH = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

#### 2. Calculate the pH and pOH of a 0.25 M NaOH solution.

- Are you working with an acid or a base? \_\_\_\_\_
- Are you given the concentration, or *Molarity* of that solution? \_\_\_\_\_
- Next, plug the concentration or Molarity into the correct equation.

*Because this is a basic solution, we have to calculate pOH first.*

$$pOH = -\log[0.25] = \underline{\hspace{2cm}}$$

*Now we can calculate the pH, because we have calculated the pOH.*

$$pH = 14 - pOH = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$