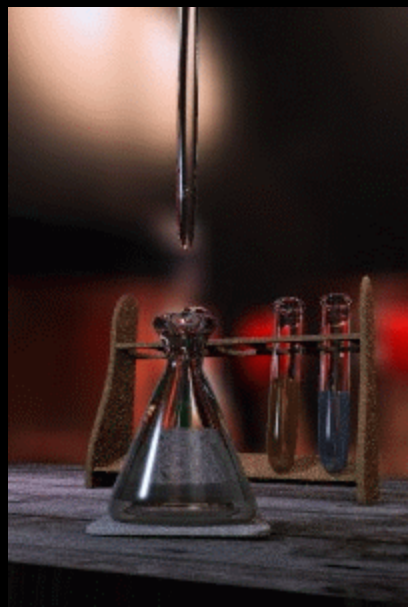
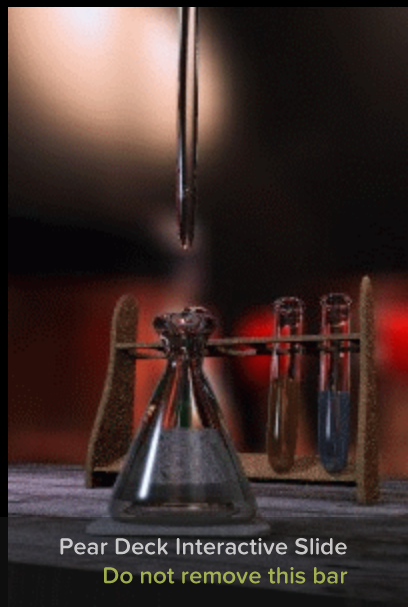
Acids and Bases

The pH Scale



What does pH stand for?



Students choose an option

The pH Scale

-The pH scale is a convenient way to describe the concentration of hydronium ions (H_3O^+) in acidic solutions as well as the hydroxide ions (OH^-)in basic solutions

-Hydronium ions are produced when acids break apart (dissociate) in water.

For example:When HCl dissociates in water the equation ,looks like this: $HCl + H_2O \rightarrow H_3O^+ + Cl^-$

-Hydoxide ions are produced when bases break apart (dissociate) in water.

For example: When NaOH dissociates in water the equation ,looks like this: $NaOH + H_2O \rightarrow Na^+ + OH^-$

The pH Scale

- pH is a mathematical scale in which the concentration of hydronium and hydroxide ions in a solution are expressed as a number from 0-14.

Hydronium (H_3O^+) and hydroxide (OH^-) ions can be thought of being on a sliding scale. As the concentration of one increases, the concentration of the other decreases

The pH Scale

- Acidic solutions contain more Hydronium (H_3O^+) ions than hydroxide ions
- Basic solutions contain more hydroxide (OH^-) ions than hydronium ions.
- Neutral solutions contain equal numbers of Hydronium (H_3O^+) and hydroxide (OH^-) ions.

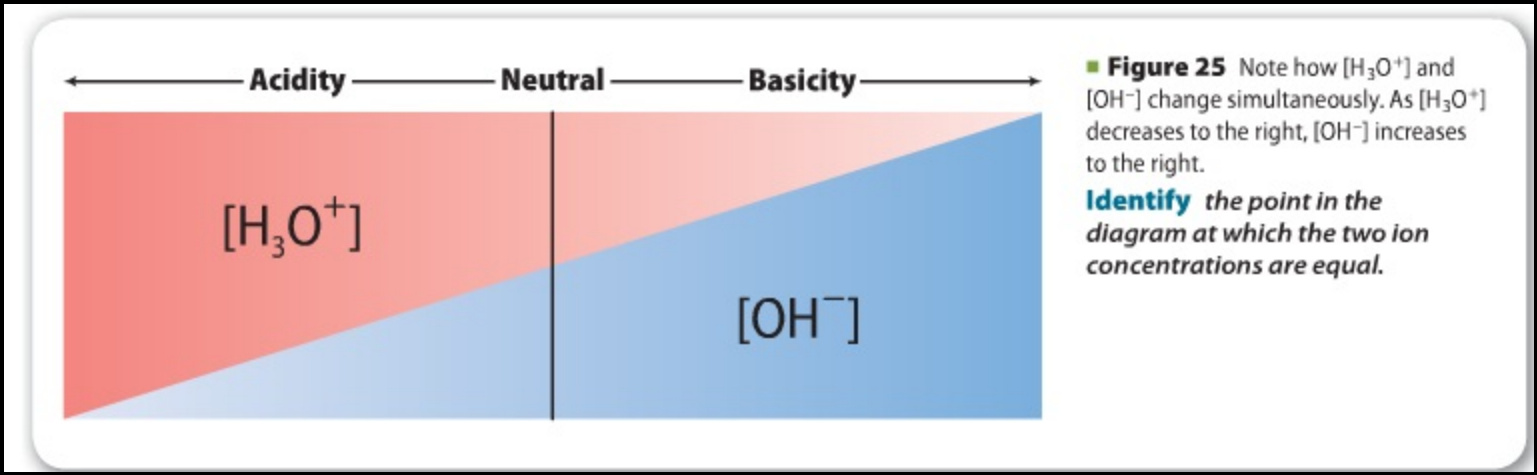


Figure 25 Note how $[H_3O^+]$ and $[OH^-]$ change simultaneously. As $[H_3O^+]$ decreases to the right, $[OH^-]$ increases to the right.

Identify *the point in the diagram at which the two ion concentrations are equal.*

The pH Scale

– *The pH decreases as the [H^+] increases.*

A lower pH means a more acidic solution.

-Acids have a pH of less than 7

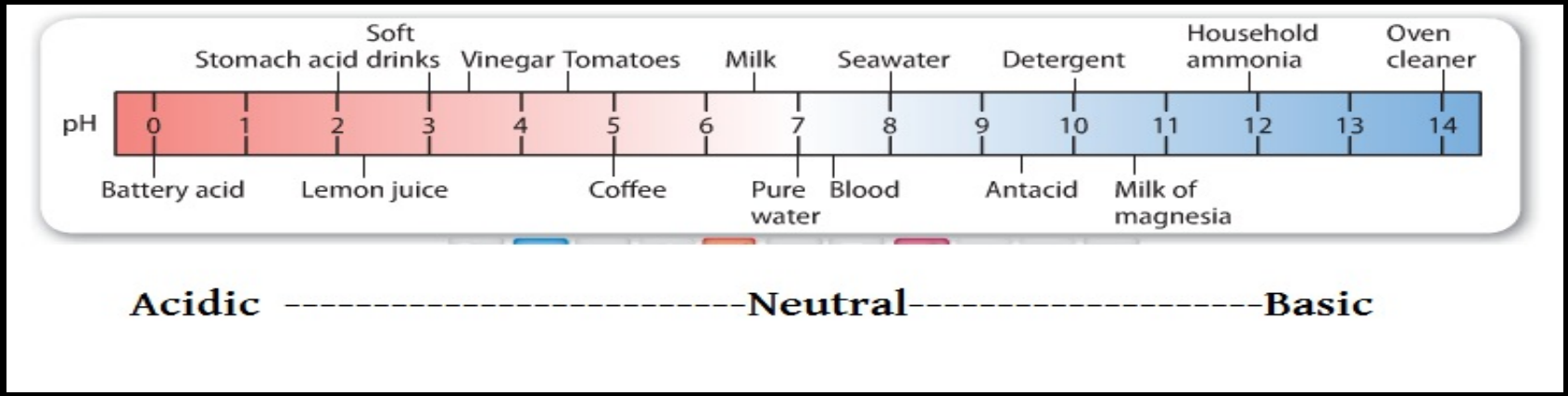
– *The pH increases as the [OH^-] increases.*

A higher pH means a more basic solution.

-Bases have a pH of greater than 7

-Neutral solutions have a pH equal to 7

- The pH scale and the pH values for several common substances are shown in the figure



The pH Scale

- The pH scale is a log scale based on powers of 10.
- the pH changes by 1 for every power-of-10 change in the $[H^+]$.
  - For example, a solution of pH 3 has an H^+ concentration which is 10 times that of a solution of pH 4 and 100 times that of a solution of pH 5.
  - This is true for bases too

  (a pH of 14 is 10x stronger than a pH of 13 and 100 x stronger than a pH of 12)

Table 16.2

The Relationship of the H^+ Concentration of a Solution to Its pH

$[H^+]$	pH
1.0×10^{-1}	1.00
1.0×10^{-2}	2.00
1.0×10^{-3}	3.00
1.0×10^{-4}	4.00
1.0×10^{-5}	5.00
1.0×10^{-6}	6.00
1.0×10^{-7}	7.00

- The end