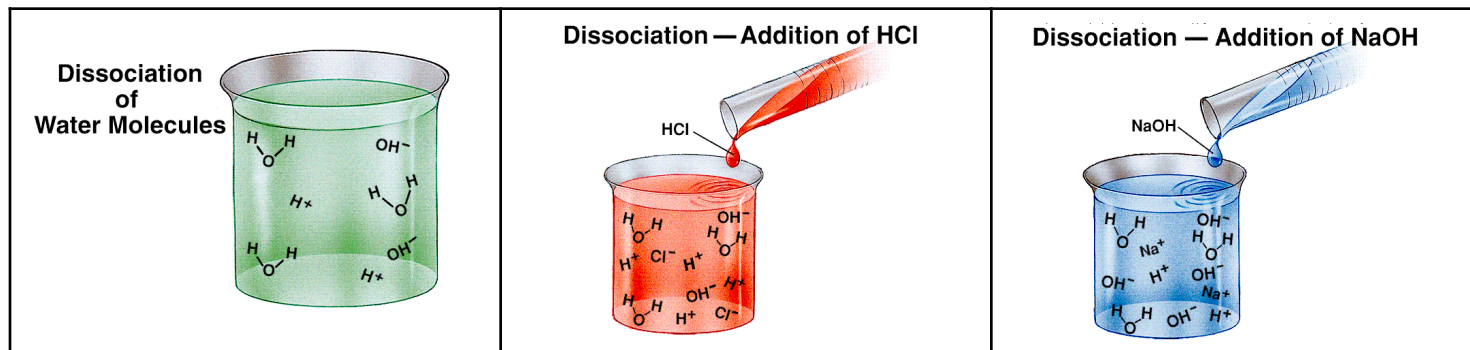


Acids, Bases & Buffers

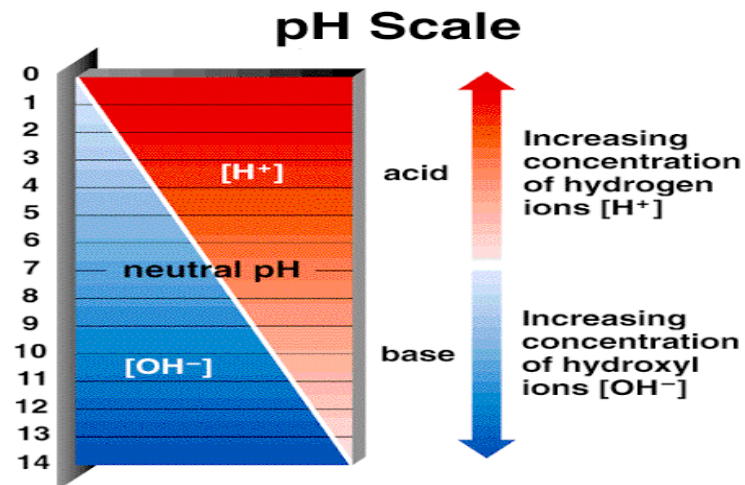
Acids and Bases

- A. ACIDS are compounds that dissociate in water and release H^+ ions. Ex) HCl , H_2CO_3
- B. BASES are compounds that dissociate in water and release OH^- ions. Ex) $NaOH$, KOH

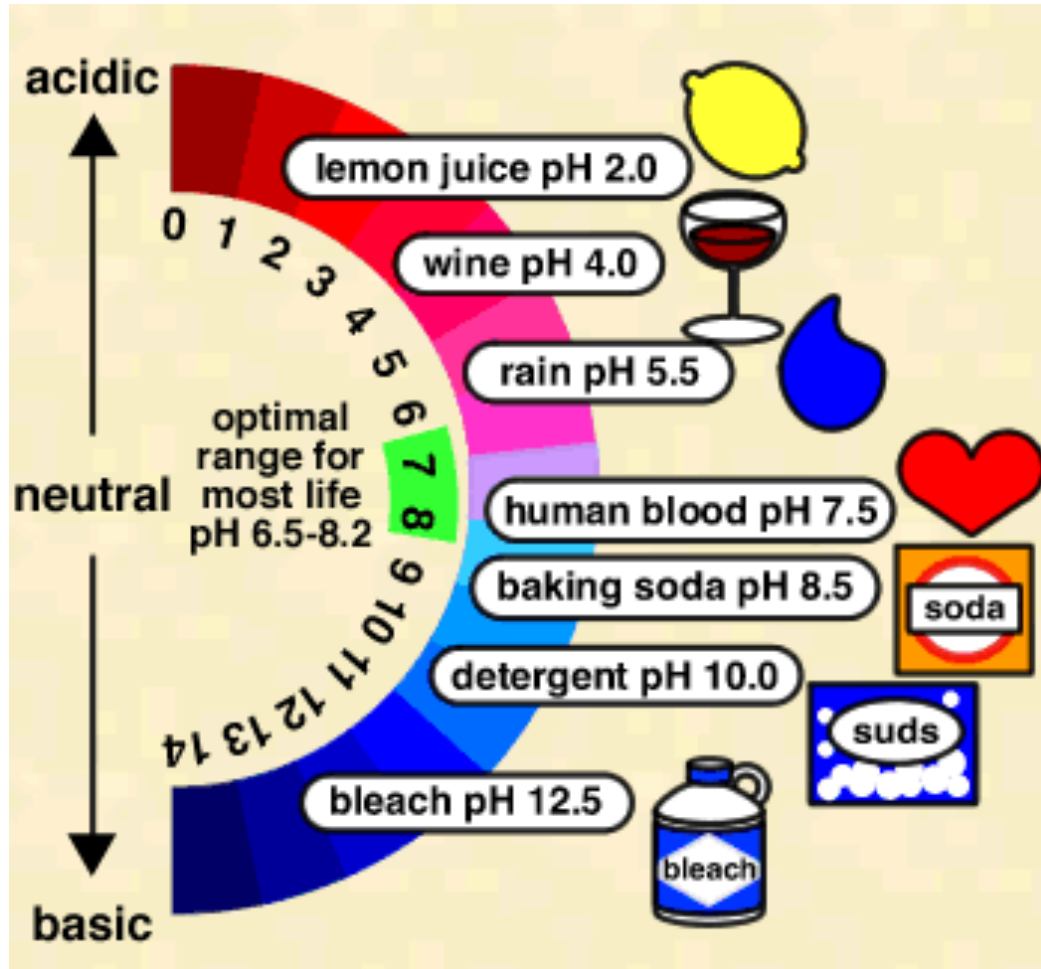


pH

- A. pH is a measure of the concentration of hydrogen ions and ranges from 0 to 14.
- B. pH less than 7 is ACIDIC
- C. The higher the number, the more basic (or alkaline) the solution
- D. pH more than 7 is a BASIC solution.



- E. pH of 7 is said to be NEUTRAL. Pure water has a pH of 7 [TED-Ed: Acids & Bases](#)



F. pH can be calculated using the following formula:
 $\text{pH} = -\log [\text{H}^+]$. For example: if $\text{pH} = 3$, $[\text{H}^+] = 10^{-3}$

G. pH scale is a logarithmic scale

- A. Each number on the scale represents a difference of magnitude of 10.
- B. Ex) a pH of 2 is ten times more acidic than a pH of 3
- C. Ex) a pH of 2 is 100 times more acidic than a pH of 4
- D. Ex) a pH of 13 is 1000 times less acidic than a pH of 10

H. All living things need to maintain a constant pH

- A. Ex) human blood $\text{pH} = 7.4$
- B. pH changes can cause enzymes to “denature” (change shape).

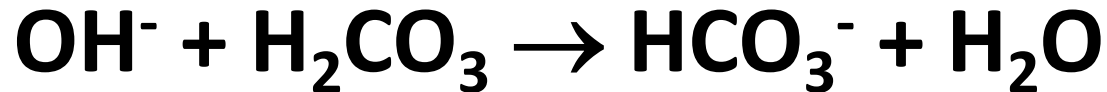
Buffers

- A. To keep the pH from changing, living cells contain buffers to keep pH constant
- B. A BUFFER is a chemical or combination of chemicals that can take up excess hydrogen ions or excess hydroxide ions.
- C. Buffers resist changes in pH when acid or base is added. However, buffers can be overwhelmed if acid or base continues to be added.

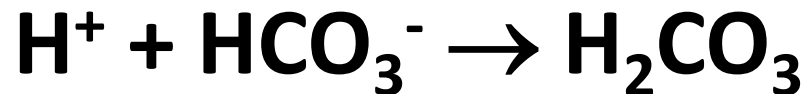
D. Two common buffers in living systems

A. Carbonic acid-bicarbonate ions (H_2CO_3 , HCO_3^-) are present in human blood to act as buffers: $\text{H}_2\text{CO}_3 \rightarrow \text{H}^+ + \text{HCO}_3^-$

a. If base is added.....

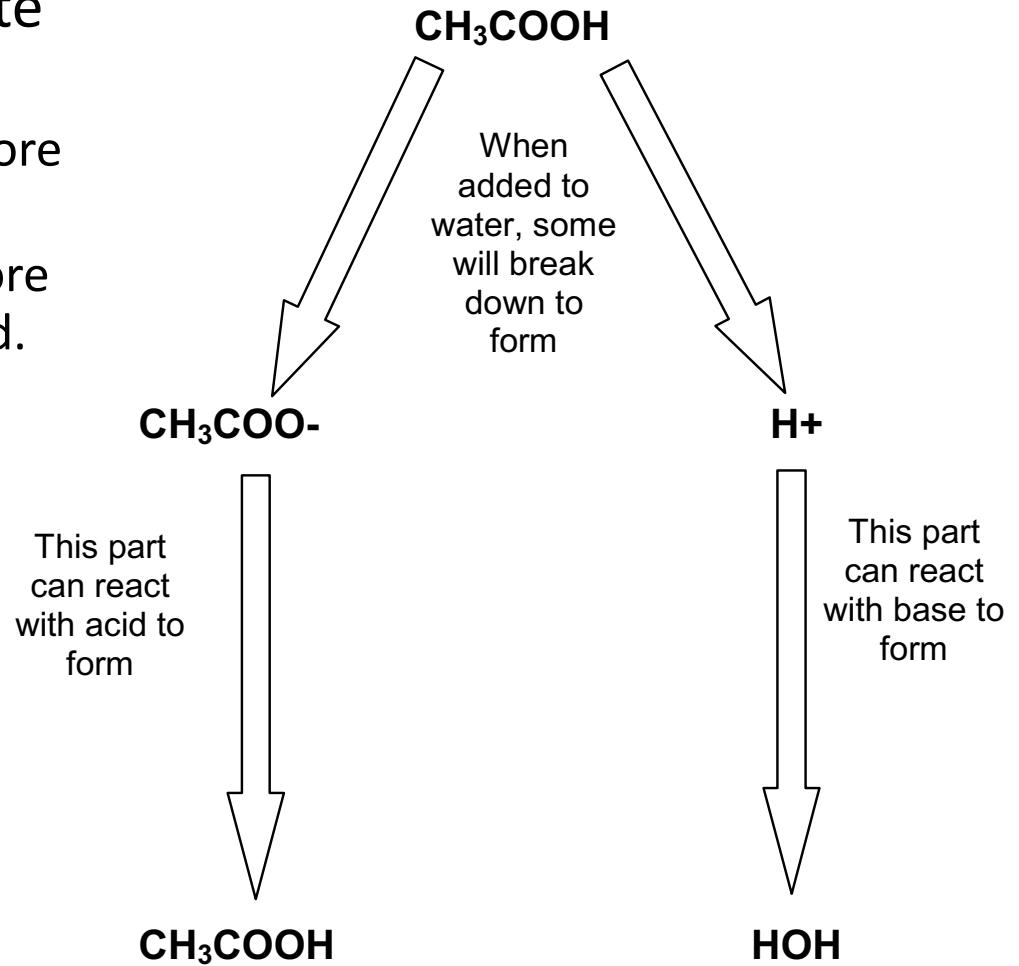


b. If acid is added.....



B. Acetic acid – Acetate Ions

- If base is added, more H_2O is formed.
- If acid is added, more CH_3COOH is formed.



In Summary: pH in Biological Systems must be maintained within a narrow range or there are health consequences

:[Water Summary by Amoeba Sisters](#)

:[Biochemical Intro by Amoeba Sisters](#)

- Blood: If not normal acidosis may result
- Acids are a normal metabolic waste product
- Blood pH is 7.4 and must be buffered to keep it normal.
- A buffer is a chemical (or combo) that keeps pH within normal limits by reacting with or releasing H^+
- Blood is buffered by carbonic acid

