

ACID -BASE BALANCE

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# Carbonic Acid–Bicarbonate Buffer System

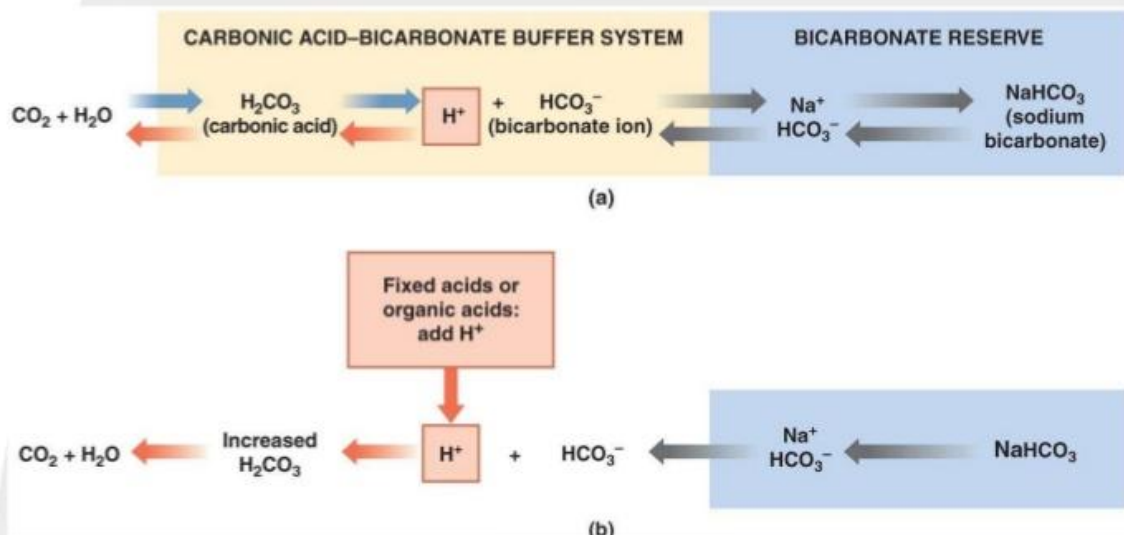
## Carbon Dioxide

- ✓ Most body cells constantly generate carbon dioxide
- ✓ Most carbon dioxide is converted to carbonic acid, which dissociates into  $H^+$  and a bicarbonate ion

Prevents changes in pH caused by organic acids and fixed acids in ECF

- ✓ Cannot protect ECF from changes in pH that result from elevated or depressed levels of  $CO_2$
- ✓ Functions only when respiratory system and respiratory control centers are working normally
- ✓ Ability to buffer acids is limited by availability of bicarbonate ions

## Acid–Base Balance



The Carbonic Acid–Bicarbonate Buffer System

## The Hemoglobin Buffer System

CO<sub>2</sub> diffuses across RBC membrane

- ✓ No transport mechanism required

As carbonic acid dissociates

- ✓ Bicarbonate ions diffuse into plasma

- ✓ In exchange for chloride ions (**chloride shift**)

- Hydrogen ions are buffered by hemoglobin molecules

- ✓ Is the only intracellular buffer system with an immediate effect on ECF pH

- ✓ Helps prevent major changes in pH when plasma P<sub>CO<sub>2</sub></sub> is rising or falling

## Phosphate Buffer System

❖ Consists of anion H<sub>2</sub>PO<sub>4</sub><sup>-</sup> (a weak acid)(pKa-6.8)

❖ Works like the carbonic acid–bicarbonate buffer system

❖ Is important in buffering pH of ICF

### Limitations of Buffer Systems

- Provide only temporary solution to acid–base imbalance
- Do not eliminate H<sup>+</sup> ions
- Supply of buffer molecules is limited