Acid-Base Equilibrium

BUFFERS

Dr. Ron Rusay

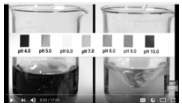
BUFFERS

Weak Acid- Weak Base Systems

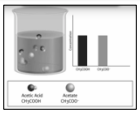
Example:

$H_2CO_3(aq)$ / $HCO_3^{-1}(aq)$ / $CO_3^{-2}(aq)$

$CO_2(g) + H_2O(l) \leftrightarrows HCO_3^{-1}(aq) + H^{+1}(aq) \leftrightarrows CO_3^{-2}(aq) + H^{+1}(aq)$



https://www.youtube.com/watch?v=XR_0k8JIawY



https://www.youtube.com/watch?v=ZLKEjXbCU30

QUESTION

In the following equilibrium:

$HCO_3^-(aq) + H_2O(l) \leftrightarrows H_2CO_3(aq) + OH^-(aq)$

A) HCO_3^- is an acid and H_2CO_3 is its conjugate base.
B) H_2O is an acid and OH^- is its conjugate base.
C) HCO_3^- is an acid and OH^- is its conjugate base.
D) H_2O is an acid and H_2CO_3 is its conjugate base.
E) H_2O is an acid and HCO_3^- is its conjugate base.

$H_2CO_3(aq)$ / $HCO_3^{-1}(aq)$ / $CO_3^{-2}(aq)$

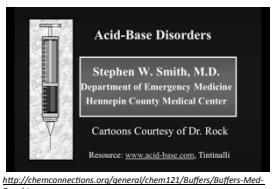
Two VERY IMPORTANT Buffer Systems

"Bicarbonate"

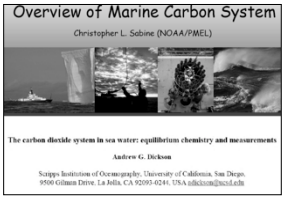
$CO_2(g) + H_2O(l) \leftrightarrows HCO_3^{-1}(aq) + H^{+1}(aq) \leftrightarrows CO_3^{-2}(aq) + H^{+1}(aq)$

1. *Blood: a human's blood serum volume is relatively small, 4-6 Liters with a narrow pH range, pH = 7.35 – 7.45; pH is maintained through buffering (homeostasis)*
   Have you ever had respiratory alkalosis during an exam?
2. *Oceans: an extraordinarily large volume of a "salt water" solution with a pH ~ 8.1; maintained through buffering*

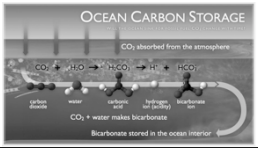
Human & Oceanic Bicarbonate Buffer Systems



http://chemconnections.org/general/chem121/Buffers/Buffers-Med-Pres.htm

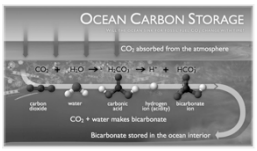


http://chemconnections.org/general/chem121/Buffers/Buffers-CO2-Oceans-2011.htm



EQUILIBRIUM

CO_2 & Oceanic Bicarbonate Buffering



$CO_2(g) + H_2O(l) \leftrightarrows HCO_3^{-1}(aq) + H^{+1}(aq) \leftrightarrows CO_3^{-2}(aq) + H^{+1}(aq)$

Oceans: pH ~ 8.1 and falling

http://www.tos.org/oceanography/issues/issue_archive/22_4.html

Increasing CO_2 is decreasing ocean pH; long term effects?

http://sos.noaa.gov/datasets/Ocean/ocean_acidification.html

Energy *(Carbon)* (CO_2) *Global Warming*

Economy (Jobs)

(Carbon) (CO_2)

https://www.co2.earth/

Global Warming / Climate Change

http://chemconnections.org/IFTVET-2016/IFVET-Global%20Warming.htm

Global Warming, Your Carbon Footprint & Your Future

http://chemconnections.org/Global%20Warming/