Blood as a buffer?

Objective: is Bicarbonate and effective buffer for blood?

Background information.

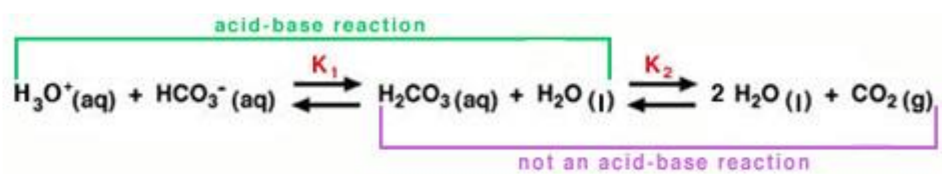
Let's say you drink orange juice or Mountain Dew or any very acidic soda. What happens the acidity of your body? What if you drink cans and cans or said soda? Does your body ever become acidic? Milk is basic, so what happens if you drink lots and lots of milk? Will your blood ever become basic?

In fact your body stays with in a very narrow range of pH regardless of how much actual acid or base you drink and if the pH of your blood changes even slightly you are in big trouble.

Acidosis: Blood pH is too low or acidic. Below 7.3
Alkalosis: Blood pH is too high or basic. Above 7.45

Your body uses buffers to maintain the pH of your blood. You constantly taking in foods that are acidic/basic. As you exercise your blood fills temporarily with a higher concentration of CO_2 (CO_2 is acidic when mixed with water. Kind of like acid rain.) So your body must work tirelessly to balance acids and bases. Interesting fact, lung function can be measured by measuring the pH of your urine! If your lungs can not remove acidic carbon dioxide effectively then your kidneys will have to work harder to remove acidic carbonates therefore altering the pH of your urine. Crazy! Delicate balance between lungs exuding CO_2, kidneys filtering out HCO_3^{-1} and all the acidic foods we are taking. Yet our pH remains constant. Great example of equilibrium.

Summary of Chemical reactions in a simplified form.



The objective is to determine if Carbonic acid (H_2CO_3) and bicarbonate (HCO_3^{-1}) can buffer a water solution to a pH near 7.4 of blood. This will indicate if the buffering of blood could solely be responsible to carbonate or is there something else that is also helping maintain the pH?

Procedure:

1. Set up a burette pH meter system.
2. Add .05M HCl to the burette.
3. Measure out a sample of $NaHCO_3$ (you determine how much you want to take).
4. Dissolve the water in a specific amount of water. (you determine and record)
5. Titrate, monitoring the pH periodically.
6. Produce two graphs.
    a. pH vs. ml acid added.
    b. pH vs. percent of acid Bicarbonate acidified.

Procedural notes:

Data:

Data in a table.

Questions:

1. What is the chemical reaction taking place in the beaker before any acid is being added?

2. What is the specific reaction occurring as the acid drips into the beaker?

3. The buffer zone is a 1ph unit in either direction from the equivalence point. What is the buffer zone?

4. Is the buffer zone in the range of the pH of blood?

5. What is the pH at the equivalence point?

6. What is the pKa of the bicarbonate buffer?