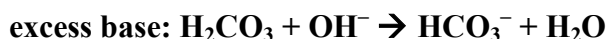
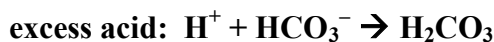


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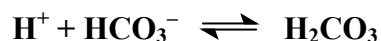
- Regulation of our blood's pH value is of vital importance for our health. In a healthy person the blood pH does not vary by more than 0.2 from the average 7.4. How does our body regulate the pH of blood?

Blood maintains a constant pH by means of a $\text{H}_2\text{CO}_3/\text{HCO}_3^-$ buffer. It resists any change in pH because any excess H^+ or OH^- is consumed as follows:



During exercise, CO_2 is produced at a rapid rate in muscle tissue. What effect does this have on the pH of blood? Why?

The buffer is an equilibrium system:



As more CO_2 is produced, it dissolves in the blood to increase the concentration of H_2CO_3 . This in turn pushes the above equilibrium to the left and the $[\text{H}^+]$ increases. The pH will therefore go down, but only slightly as the buffer system is highly effective.

Hyperventilation (rapid and deep breathing) can occur during intense exertion. What effect does hyperventilation have on the pH of blood? Why?

Hyperventilation results in a decrease in the amount of CO_2 in the blood. This pushes the $\text{CO}_2 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{CO}_3$ equilibrium to the left which in turn pushes the $\text{H}^+ + \text{HCO}_3^- \rightleftharpoons \text{H}_2\text{CO}_3$ equilibrium to the right to produce more H_2CO_3 . The net effect is thus to lower $[\text{H}^+]$ and cause a small increase in pH.

(The standard treatment for hyperventilation is to get the patient to breath into a paper bag and rebreathe the CO_2 they have exhaled.)