

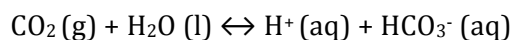
Buffers

Name: _____

Date: _____ Per: _____

1. What ions are related to pH?
2. How are the ions you chose in number 1 related to pH?
3. What does a buffer do?
4. Some medicines contain buffers? Why would it be beneficial for a medication to contain buffers?
5. Predict some non-medicinal uses for buffers?

The pH of human blood must be kept within a narrow range of 7.1 to 7.7. Outside this range, proteins in the body lose their structure and ability to function. Fortunately, a number of buffers maintain the necessary acid/base balance. The carbonic acid/hydrogen carbonate buffer is the most important. As acids and bases are dumped into the blood stream as a result of normal activity, the bloods buffer systems shift to effectively maintain a healthy pH. Depending upon the body's metabolic rate and other factors, the equilibrium will shift according to Le Chatelier's principle. In addition, the lungs can alter the rate at which CO₂ is expelled from the body by breathing and the kidneys can alter the rate of removal of the bicarbonate ion.



6. Calculate the molarity of the H⁺ in blood at a normal pH=7.4 and at pH=7.1, the lower limit of a healthy pH range. If the blood's pH changes from 7.4 to 7.1, how many times greater is the concentration of hydrogen ion?

When you exercise your body produces lactic acid. This acid builds up in your muscles and is broken down by the body. When it is broken down, hydrogen ions are introduced to your bloodstream.

7. What ion in the buffer system will react with excess hydrogen if it is added to the blood stream?

Another physiological response to strenuous exercise is rapid breathing.

8. What gas is expelled from your body when you breathe out?
9. Use Le Chatelier's principle to explain why removing this gas helps to assist the buffer system in removing the hydrogen ions from your blood.

10. In the following situations, predict whether the pH of the blood will rise or fall, and which way the equilibrium of the reaction will shift. Support your response with an explanation.

- a. A person with severe stomach flu vomits many times during a 24-hour period.
- b. To combat heartburn, a person foolishly takes a large amount of sodium bicarbonate.