

Activity 36: Buffers and the Bicarbonate Buffer System

Learning Objectives

Predict whether certain compounds can be components of a buffer

Predict the effect on the bicarbonate buffer system in the blood under conditions of hyperventilation and hypoventilation

Reason how the conditions of acidosis and alkalosis can be treated based on the bicarbonate buffer system

Estimated Completion Time 45 Minutes

Instructor Information

Students will find this activity useful to the health professions. It is useful to stress that H_3O^+ measures acidity.

ANSWERS TO QUESTIONS

1.
 - a. No. It is a strong acid.
 - b. Yes. The weak acid could be H_3PO_4 , or with KH_2PO_4 as the weak acid, the conjugate base (salt) would be K_2HPO_4 .
 - c. Yes. The conjugate base (salt) could be NaCH_3COO .
 - d. No. Water is the solvent and so cannot be part of the buffer system.
2.
 - a. Increasing CO_2 will ultimately increase H_3O^+ and the blood will become more acidic, so the acidity increases (pH goes down). The concentration of H_3O^+ determines acidity. Bicarbonate could be administered, which would have the effect of shifting the equilibrium back to the left by complexing the excess acid. If possible, patients could also exhale more deeply.
 - b. Under these conditions, the pH of the blood will rise. A person could breathe a CO_2 -rich atmosphere, which would raise the concentration of CO_2 in the lungs.
 - c. Such patients will breathe more rapidly (increasing their ventilation rate) and exhale deeply in an attempt to exhale more CO_2 .

3. They would go into metabolic alkalosis. (This condition is rare, but it can occur.)

Activity 36: Skill Development

1. a. No b. Yes c. Yes d. No
2. a. Respiratory acidosis
b. If more CO_2 is present, the equilibrium shifts to the right, creating more acid (H_3O^+) and causing the acidosis.
c. Lower than normal
d. Administer bicarbonate.
e. Respiratory alkalosis
f. Because the person is exhaling too much CO_2 , the equilibrium shifts to the left.
g. Higher than normal
h. Have the person breathe into a paper bag or other container to enrich the amount of CO_2 per breath.