

# AP Chemistry Review Questions

## Integrating Content, Inquiry and Reasoning

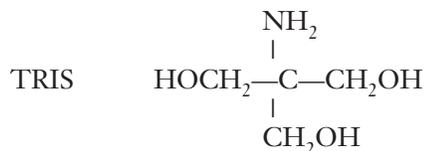
1. The major buffer in blood is composed of the weak acid carbonic acid ( $\text{H}_2\text{CO}_3$ ) and its conjugate base, bicarbonate ion ( $\text{HCO}_3^-$ ). The normal pH of blood is 7.2–7.4, which is very far removed from the  $\text{p}K_a$  value. The pH is kept in check by the lungs, which remove  $\text{CO}_2$  via exhalation, and by the kidneys, which excrete acid ( $\text{H}_3\text{O}^+$ ) in the urine. People with impaired lung function are not able to exchange carbon dioxide efficiently between the lungs and air. The result is an increase in the amount of  $\text{CO}_2$  dissolved in the blood.

*a.* How does this affect the buffer balance in the blood?

*b.* Which term, respiratory acidosis or respiratory alkalosis, would better describe the resulting condition?

2. Explain why a mixture of the strong acid HCl and its conjugate base NaCl does not provide buffering action.

3. Forensic analysis of DNA by electrophoresis requires the use of a pH 8.3 buffer to ensure that the DNA phosphate groups remain negatively charged. The major constituent of electrophoresis buffers is called TRIS, which stands for tris(hydroxymethyl)aminomethane. Its structure is shown below. What weak acid/weak base combination used in this activity is TRIS most analogous to? Identify the basic functional group in TRIS that is protonated to give a weak acid.



4. Many soft drinks contain phosphate buffers. Calculate the pH of an 8 oz. soft drink containing 4.4 g of sodium dihydrogen phosphate (formula weight = 120 g/mole) and 5.4 g of sodium hydrogen phosphate (formula weight = 142 g/mole).