

Answer on Question #56388 – Chemistry – General Chemistry

Question:

A buffer is made by dissolving HC₂H₃O₂ and NaC₂H₃O₂ in water.

Write an equation that shows how this buffer neutralizes added acid.

Express your answer as a chemical equation. Identify all of the phases in your answer.
?????

Write an equation that shows how this buffer neutralizes added base.

Express your answer as a chemical equation. Identify all of the phases in your answer.
????

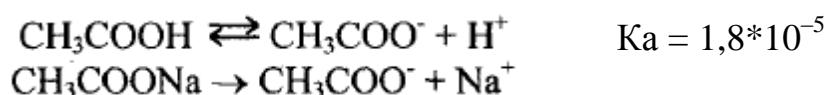
Calculate the pH of this buffer if it is 0.22 M HC₂H₃O₂ and 0.45 M C₂H₃O₂⁻. The Ka for HC₂H₃O₂ is 1.8×10⁻⁵.

Express your answer using two decimal places.

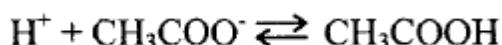
pH = ???

Solution:

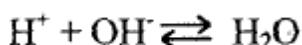
Processes of dissociation in the solution containing weak CH₃COOH acid and its salt:



At addition of acid in solution ions of hydrogen communicate in weak acid:



At addition of the basis in solution hydroxide ions communicate in weak electrolyte – water:



The constant of dissociation of acid is equal

$$K_a = \frac{[\text{H}^+][\text{CH}_3\text{COO}^-]}{[\text{CH}_3\text{COOH}]}$$

$$\text{Then } [\text{H}^+] = K_a \frac{[\text{CH}_3\text{COOH}]}{[\text{CH}_3\text{COO}^-]}$$

As degree of dissociation of acetic acid $\alpha \ll 1$, equilibrium concentration c[CH₃COOH] is approximately equal to initial concentration with c(CH₃COOH), and equilibrium concentration acetate ions [CH₃COO⁻] is approximately equal to initial concentration of acetate of sodium with (CH₃COONa):

$$[CH_3COOH] = c(CH_3COOH), [CH_3COO^-] = c(CH_3COONa).$$

$$\text{Then } [H^+] = K_a \frac{c(CH_3COOH)}{c(CH_3COONa)}$$

After logarithming and multiplication on (-1) we will receive

$$pH = -\lg K_a - \lg \frac{c(CH_3COOH)}{c(CH_3COONa)} = -\lg(1.8 \cdot 10^{-5}) - \lg(0.22/0.45) = 5.06$$

Answer: pH of a buffer it is equal 5.06.