

For an acetate buffer at pH 4.9, what will be the concentration of acetate ion if the concentration of acetic acid is 0.06M (pK<sub>a</sub> of acetic acid is 4.8)?

**Solution:**

The pH of acetate buffer solution can be found by using Henderson–Hasselbach equation:

$$pH = pK_{acetic\ acid} + \lg \frac{C_M(CH_3COO^-)}{C_M(CH_3COOH)};$$

(lg – decimal logarithm, C<sub>M</sub> – molar concentration of mentioned particle).

As we need to find concentration of acetate ion, we can transform equation, mentioned above, to match our task:

$$pH - pK_{acetic\ acid} = \lg \frac{C_M(CH_3COO^-)}{C_M(CH_3COOH)};$$

As the **logarithm of a given number x is the exponent to which another fixed number, the base b, must be raised, to produce that number x** ( $\log_b x = y \Leftrightarrow x = b^y$ ), then we can transform this equation further:

$$\frac{C_M(CH_3COO^-)}{C_M(CH_3COOH)} = 10^{(pH - pK_{acetic\ acid})};$$

$$C_M(CH_3COO^-) = C_M(CH_3COOH) * 10^{(pH - pK_{acetic\ acid})};$$

Let's substitute numbers:

$$C_M(CH_3COO^-) = 0.06M * 10^{(4.9 - 4.8)} = 0.06M * 1.259 = 0.07554 M$$

**Answer:**

The concentration of acetate ion in the buffer solution is 0.07554 M.