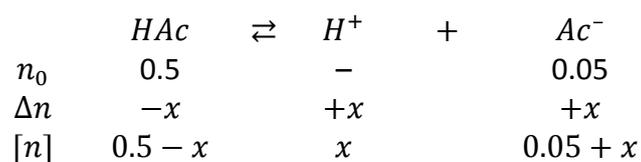# Answer on the question #56438 - Chemistry - General Chemistry

Question:

What is the pH of a buffer solution containing 0.500 moles of acetic acid (Ka = 1.8 x 10^-5, pKa = 4.74) and 0.0500 moles of sodium acetate?

Solution:

To find the pH, we need to find the concentration of hydrogen ions. Let's consider the reaction of dissociation of acetic acid:

$$
\begin{array}{ccccccc}
 & HAc & \rightleftarrows & H^+ & + & Ac^- \\
n_0 & 0.5 & & - & & 0.05 \\
\Delta n & -x & & +x & & +x \\
[n] & 0.5 - x & & x & & 0.05 + x
\end{array}
$$

The relation for the equilibrium constant is:

$$ K_a = \frac{[H^+][Ac^-]}{[HAc]} = \frac{x \cdot (0.05 + x)}{(0.5 - x)} = 1.8 \cdot 10^{-5} $$

$$ x^2 + 5.0018 \cdot 10^{-2} \cdot x - 9 \cdot 10^{-6} = 0 $$

$$ x = [H^+] = 1.79 \cdot 10^{-4} \ mol $$

Then, taking the negative logarithm of the H^+ concentration,

$$ pH = -\lg[H^+] = 3.75 $$

Answer: pH=3.75