

Answer on Question #52021, Chemistry, Physical Chemistry

Question: If 50 mL 0.1M NaOH and 100 mL 0.1M CH₃COOH is mixed to make a buffer, what is the pH of this buffer? $K_a = 1.8 \times 10^{-5}$. If 100 mL 0.6M more NaOH is mixed with this buffer solution, what is the new pH?

Answer:

The pH can be founded by using of Henderson-Hasselbalch equation:

$$pH = pKa + \log \frac{[NaOH]}{[CH_3COOH]}$$

The number of moles of NaOH = $0.1M \times 0.05L = 0.005$ moles.

The number of moles of CH₃COOH = $0.1M \times 0.1L = 0.01$ moles

$pKa = -\log Ka = 4.75$

So,

$$pH = 4.75 + \log \frac{0.005}{0.01} = 4.45$$

After addition of solution of NaOH the added number of moles of NaOH = $0.6M \times 0.1L = 0.06$ moles.

So, the total number of moles of NaOH in the new solution is $0.005 + 0.06 = 0.065$ moles.

The new pH will be:

$$pH = 4.75 + \log \frac{0.065}{0.01} = 5.56$$