

Ionic Equilibriums in Water



#2

We add 10.0 mL HCl 0.100 mol/L to 100.0 mL of the previous buffer solution (500.0 mL buffer solution containing 0.0300 mole of NaOAc and 0.0250 mole of HOAc). Calculate pH.

Solution

10.0 mL HCl 0.100 mol/L contains 0.00100 moles of HCl.

The strong acid HCl will react with the base of the buffer solution:



Afterwards, there will be less NaOAc and more HOAc. The neutral salt NaCl is of no importance.

mole	NaOAc	HCl	HOAc
Start	0.0060	0.00100	0.0050
Δ	-0.00100	-0.00100	+0.00100
After reaction	0.0050	0	0.0060

After this reaction, we still have a buffer solution:

$$\text{pH}_{\text{buffer}} = \text{p}K_{\text{aHOAc}} + \log \frac{[\text{B}]}{[\text{A}]} = 4.75 + \log \frac{\frac{0.050 \text{ mol}}{0.110 \text{ L}}}{\frac{0.060 \text{ mol}}{0.110 \text{ L}}} = \mathbf{4.67}$$

The pH has decreased, but only slightly (4.83 \rightarrow 4.67).