\[ \text{XX} \quad \text{pK}_a = 4.76 \]

1 L 1 M Acetate Buffer
\[ \text{pH} = 4.5 \]

mixed 600 mL 0.9 M acetate buffer
\[ \text{pH} = 4.8 \]

Then 12 0.1 M HCl

What is final pH

---

Solution #1

4.5 = 4.76 + \log \frac{S}{A}

1M x 1 mole = 1 mole Buffer

\[ S + A = 1 \text{ mole} \quad S = 1 - A \]

4.5 = 4.76 + \log \frac{1 - A}{A}

Acid\_1 = \text{moles Acid}

Salt\_1 = 1 - Acid\_1
\[ 4.5 = 4.76 + \log \frac{1 - A}{A} \]

\[ -0.26 = \log \frac{1 - A}{A} \]

\[ 10^{-0.26} = \frac{1 - A}{A} \]

\[ (10^{-0.26})(A) = 1 - A \]

\[ (10^{-0.26})(A) + A = 1 \]

\[ A (10^{-0.26} + 1) = 1 \]

\[ A = \frac{1}{(10^{-0.26} + 1)} \]

\[ S_1 = 1 - \frac{1}{(10^{-0.26} + 1)} \]
$S_2 + A_2 = \text{moles buffer solution #2}$

$4.8 = 0.61 \times \frac{\text{moles} \text{ buffer}}{0.3 \text{ moles buffer}}$

$S + A = 0.3$

$A = 0.3 - S$

$4.8 = 4.76 + \log \frac{S}{0.04} = \log \frac{A}{3-S}$

$0.04 = \log \frac{A}{3-S}$

$10^{0.04} = \frac{A}{3-S}$

$A_2 = 0.3 - S_2$

$S_2$

$\text{Total salt} = S_1 + S_2$

$\text{Total acid} = A_1 + A_2$
\[
H_XC \rightleftharpoons H^+ + Ac^-
\]

Gain Acid

\[
d x, \text{ moles} \quad l \quad = 0.1 \text{ moles HCl added}
\]

\[
S = S_1 + S_2 - .1
\]

\[
A = A_1 + A_2 + .1
\]

\[
\text{Acid} \quad p\text{H} = 4.76 + \log \left( \frac{S_1 + S_2 - .1}{A_1 + A_2 + .1} \right) / 2.6
\]

\[
\text{Base} \quad p\text{H} = 4.76 + \log \left( \frac{S_1 + S_2 + .1}{A_1 + A_2 - .1} \right) / 2.6
\]
\[ 500 \text{ mL} \] 0.5 M Acetic Acid buffer

\[ \text{pH} 4.4 \]

\[ \text{moles HCl} \quad \frac{S}{A} \frac{1}{4} \]

\[ \text{moles stored with} \]

\[ 0.5L \times 0.5 \text{ moles/L} = 0.25 \text{ moles buffer} \]

\[ S + A = 0.25 \]

\[ S = 0.15 \text{ moles } \] starting

\[ A = 0.10 \text{ moles} \]

\[ S + A = \text{9 parts} \]

\[ S = \frac{1}{9} \text{ parts (moles)} \]

\[ 0.25 \times \frac{1}{9} = Z \text{ moles salt} \]

\[ 0.2S - Z = Y \text{ mole acid} \]

\[ 0.15 \text{ moles} S - Z = \text{moles HCl to add} \]
GLY-ASP-Leu-GLU-Lys-Thr-COO-
PKa of Amino = 9.5
PKa of Carboxyl = 2.2
PKa of Carboxyl = 4.5
PKa of Amines = 12

pH = 3.3
What is charge?

pH < PKa by more than 1 unit
The proton is on
Arg pH7