# Answer on Question #59773, Chemistry / General Chemistry

1. Whatt volume of 1.00 M solutions of NaOH and acetic acid must be mixed to give 1.00 l of solution having a pH of 4.00?

**Solution:**

$NaOH + CH_3COOH = CH_3COONa + H_2O$

If pH<7, we must neutralize not all acid.

$CH_3COOH+CH_3COONa$ – acetic buffer system

For calculation pH of buffer system (acid type):

$$pH = pKa + \log\frac{[salt]\times V(salt)}{[acid]\times V(acid)}$$

pKa = -logKa

$pKa = -\log 1.8\times 10^{-5} = 4.75$ (acetic acid)

$$4 = 4.75 + \log\frac{[1mol/L]\times V(salt)}{[1mol/L]\times V(acid)}$$

$$4 = 4.75 + \log\frac{V(salt)}{V(acid)}$$

$$\log\frac{V(salt)}{V(acid)} = 4 - 4.75 = -0.75$$

$$\frac{V(salt)}{V(acid)} = 10^{-0.75} = 0.177$$

$$\frac{V(salt)}{V(acid)} = \frac{0.177}{1}$$

For 1L of solution we need 1 portion of acid and 0.177 portion of salt.

1.177 – 1000ml
0.177 – Xml

$$X = \frac{0.177\times 1000}{1.177} = 150ml$$ - volume of salt

1000ml – 150ml = 850ml - volume of acid

For 150ml of salt (1M) we need 75ml 1M NaOH and 75ml 1M $CH_3COOH$.

Total volume $CH_3COOH$: 850ml + 75ml (for salt) = 925ml

Total volume NaOH – 75ml (for salt).

**Answer:** must be mixed 75ml NaOH and 925ml $CH_3COOH$.