A Qualitative Look at pH Using the Henderson-Hasselbalch Equation

We will use Acetic acid, pKa = 4.74, for our examples.

[HA] = CH_3CO_2H

[A^-] = $CH_3CO_2^-$

pH = pKa + log [HA] / [A^-]

When [CH_3CO_2H] = [$CH_3CO_2^-$]

pH = 4.74 + log [CH_3CO_2H] / [$CH_3CO_2^-$]

pH = 4.74 + log 1

pH = 4.74 + 0 = 4.74, thus pH = pKa

When [CH_3CO_2H] > [$CH_3CO_2^-$]

pH = 4.74 + log [CH_3CO_2H] / [$CH_3CO_2^-$]

pH = 4.74 + log of a number less than 1 or <0 is “negative”

pH = 4.74 – some number

pH < 4.74, thus when we have more HA than A^- the pH will decrease

When [CH_3CO_2H] < [$CH_3CO_2^-$]

pH = 4.74 + log [CH_3CO_2H] / [$CH_3CO_2^-$]

pH = 4.74 + log of a number greater than 1 or >0 is “positive”

pH = 4.74 + some number

pH > 4.74, thus when we have more A^- than HA the pH will increase