A Qualitative Look at pH Using the Henderson-Hasselbalch Equation

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

[HA] = CH3CO2H

[A-] = CH3CO2-

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

When [CH3CO2H] = [CH3CO2-]

pH = 4.74 + log [CH3CO2H] / [CH3CO2-]

pH = 4.74 + log 1

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

When [CH3CO2H] > [CH3CO2-]

pH = 4.74 + log [CH3CO2H] / [CH3CO2-]

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 [CH3CO2H] < [CH3CO2-]

pH = 4.74 + log [CH3CO2H] / [CH3CO2-]

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