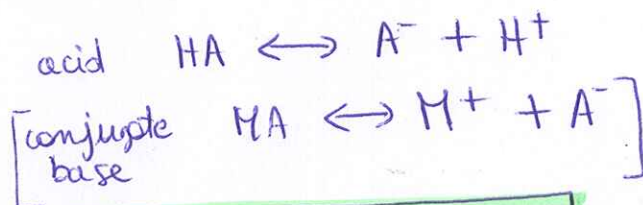


CALCULATING THE pH OF A BUFFER SOLUTION

buffer solution = weak acid + its conjugate base
(HA) (MA)



$$K_a = \frac{[A^-][H^+]}{[HA]}$$

where we assume

$[A^-] \approx$ original concentration of the base $C_{0,MA}$ (complete dissociation)
 $[HA] \approx$ original concentration of the acid $C_{0,HA}$ (because HA is a weak acid)

$$-\log [H^+] = -\log \frac{K_a [HA]}{[A^-]} = -\log K_a - \log \frac{[HA]}{[A^-]}$$

$$\boxed{pH} = pK_a - \log \frac{[HA]}{[A^-]} = pK_a + \log \frac{[A^-]}{[HA]}$$

$\leftarrow \approx C_{0,MA}$
 $\leftarrow \approx C_{0,HA}$