1/28/15

$Ca(IO_3)_2$ $K_{sp} = 7.1\times10^{-7}$ $Ca(IO_3)_{2(s)} \rightleftharpoons Ca^{+2}{}_{(aq)} + 2IO_3^-{}_{(aq)}$

$[Ca(IO_3)_2] = [Ca^{+2}] = \frac{1}{2}[IO_3^-]$

$[IO_3^-] = 2[Ca^{+2}]$

$K_{sp} = [Ca^{+2}][IO_3^-]^2 = [Ca^{+2}][2Ca^{+2}]^2$

$= 4[Ca^{+2}]^3 = 7.1\times10^{-7}$

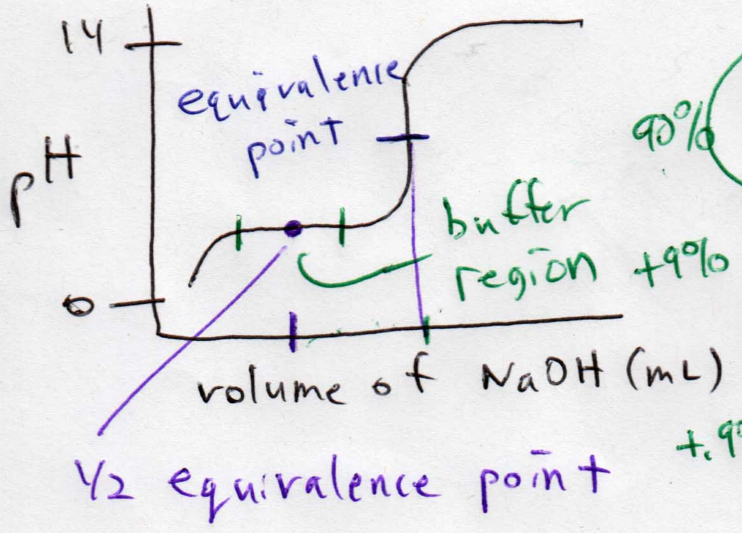
$[Ca^{+2}] = 5.62\times10^{-3}M = [Ca(IO_3)_2]$

5.62×10^{-3} mol/L $\div 1000 = 5.62\times10^{-6}$ mol/mL

5.62×10^{-6} mol/mL $\times$ MM of $Ca(IO_3)_2 =$

5.62×10^{-6} mol/mL $\times$ 389.9 g/mol $= 2.19\times10^{-3}$ g/mL

Weak acid + strong base (acetic acid + NaOH)



1.0M HCl pH ≈ 0

$pH = -\log_{10}(1.0) = 0$

90%

0.1M HCl pH = 1

$pH = -\log_{10}(10^{-1}) = -(-1) = 1$

+9%

0.01M HCl pH = 2

+.9%

0.001M HCl pH = 3

50mL 1.0M acetic acid + 50mL 0.5M NaOH

After neutralization $[CH_3COOH] = 0.25M$

$[CH_3COO^-] = 0.25M$

	CH_3COOH	CH_3COO^-	H^+
I	.25	.25	0
C	−x	+x	+x
E	.25−x	.25+x	+x

$$K_a = \frac{[H^+][A^-]}{[HA]} = \frac{x(.25+x)}{(.25-x)} = 1.76\times10^{-5}$$

If $x << .25$, $.25 - x \approx .25$ and $.25 + x = .25$

$$\left(K_a = \frac{x(.25)}{(.25)} = x = [H^+] \right) -\log_{10}$$

$$pK_a = pH$$ ← True when [acid] = [conjugate base]

1 mol acetic acid

→ ½ mol acetate

½ mol acetic acid

↑ ½ neutralized

At the half-equivalence point of a titration, [acid] ≈ [conjugate base]

The strength of an acid can be determined by finding the pH of the solution at the half equivalence point.

$$\left(K_a = \frac{[H^+][A^-]}{[HA]} \right) -\log_{10}$$

$\log xy = \log x + \log y$

$$-\log_{10} K_a = -\log_{10}\left(\frac{[H^+][A^-]}{[HA]}\right)$$

$$-\log_{10} K_a = -\log_{10}[H^+] + -\log_{10}\left(\frac{[A^-]}{[HA]}\right)$$

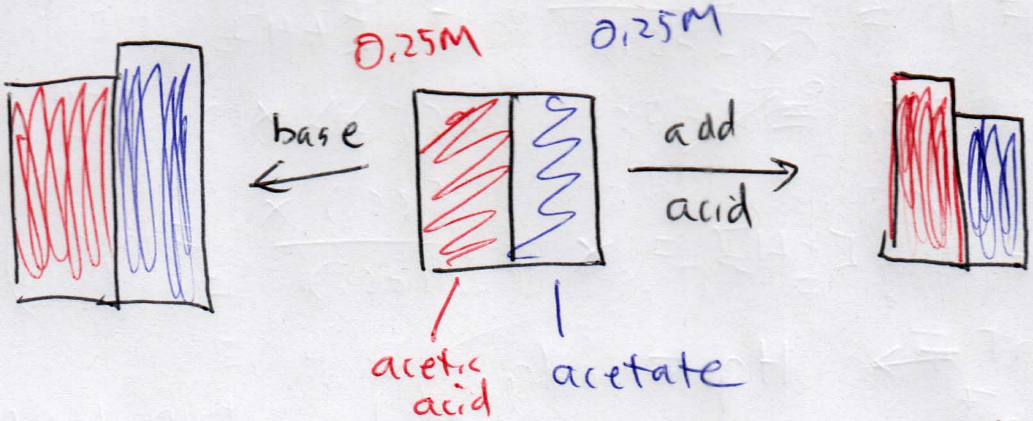
$$pK_a = pH - \log_{10}\left(\frac{[A^-]}{[HA]}\right)$$

Henderson Hasslebach equation

$$pH = pK_a + \log_{10}\left(\frac{[A^-]}{[HA]}\right)$$ *

*Assuming equilibrum concentrations

*Assuming concentrations <u>don't</u> change much at equilibrium.



Buffer solution – A solution composed of an acid and its conjugate base that is able to maintain a particular pH level even when small quantities of ~~an~~ an acid or base are added to the buffer.

buffer capacity – how well a buffer resists change → depends ~~of~~ on quantity of the acid + its conjugate present

buffer range – the pH range that a buffer works best → ±1 pH unit from pK_a

Given an unlimited quantity of solid sodium acetate and concentrated acetic acid, prepare a buffer solution with pH = 3.

Quiz #2 on Monday