

(17b) chp 17

0.0075 M HBut (WA) 0.085 M NaBut (Salt of the WA)

Common ion.

① What do I have?
 ② Ionization eqns

(WA) (conj base) (common ion)

$HBut \rightarrow H^+ + But^-$

I	0.0075	0	0
Δ	-x	+x	+x
E	0.0075-x	x	0.085+x

$NaBut \rightarrow Na^+ + But^-$
 0.085 0.085 0.085

Forces rxn to go ← decreasing $[H^+]$ in solⁿ.

$$K_a = \frac{x(0.085+x)}{0.0075-x} = 1.5 \times 10^{-5}$$

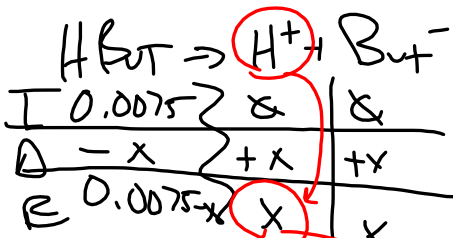
$$x = 1.32 \times 10^{-6}$$

0.0075 - 0.012647% ionized

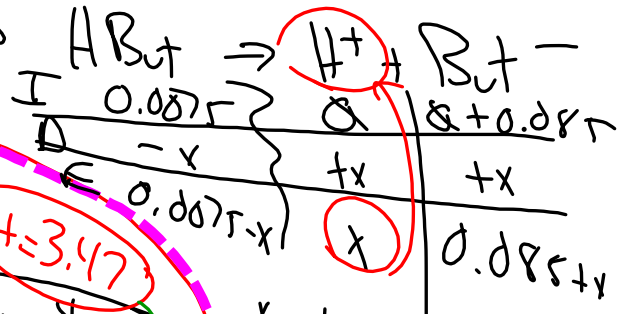
BUFFER

① 0.0075M HBut $\text{pH}=?$

0.0075M HBut + 0.085M NaBut



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$$\frac{x^2}{0.0075-x} = 1.5 \times 10^{-5}$$

if ignore "-x" = $3.354 \times 10^{-4} = x$

$$\frac{3.354 \times 10^{-4}}{0.0075} \times 100 = 4.47\%$$

Safe (ignore "-x")

Add base



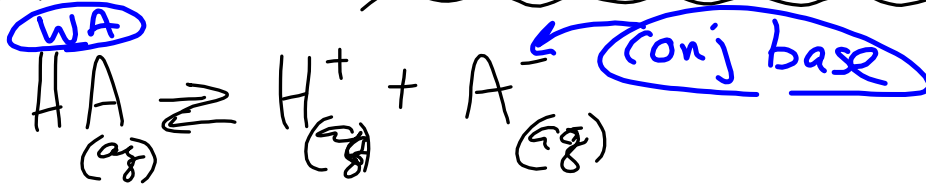
Added conj base to WA

$\text{pH} \uparrow$
 HBut = WA
 NaBut = conj Base

$\text{pH} = 3.47$

$\text{pH} = 5.68$

Buffer \rightarrow Henderson-Hasselbach eqn



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

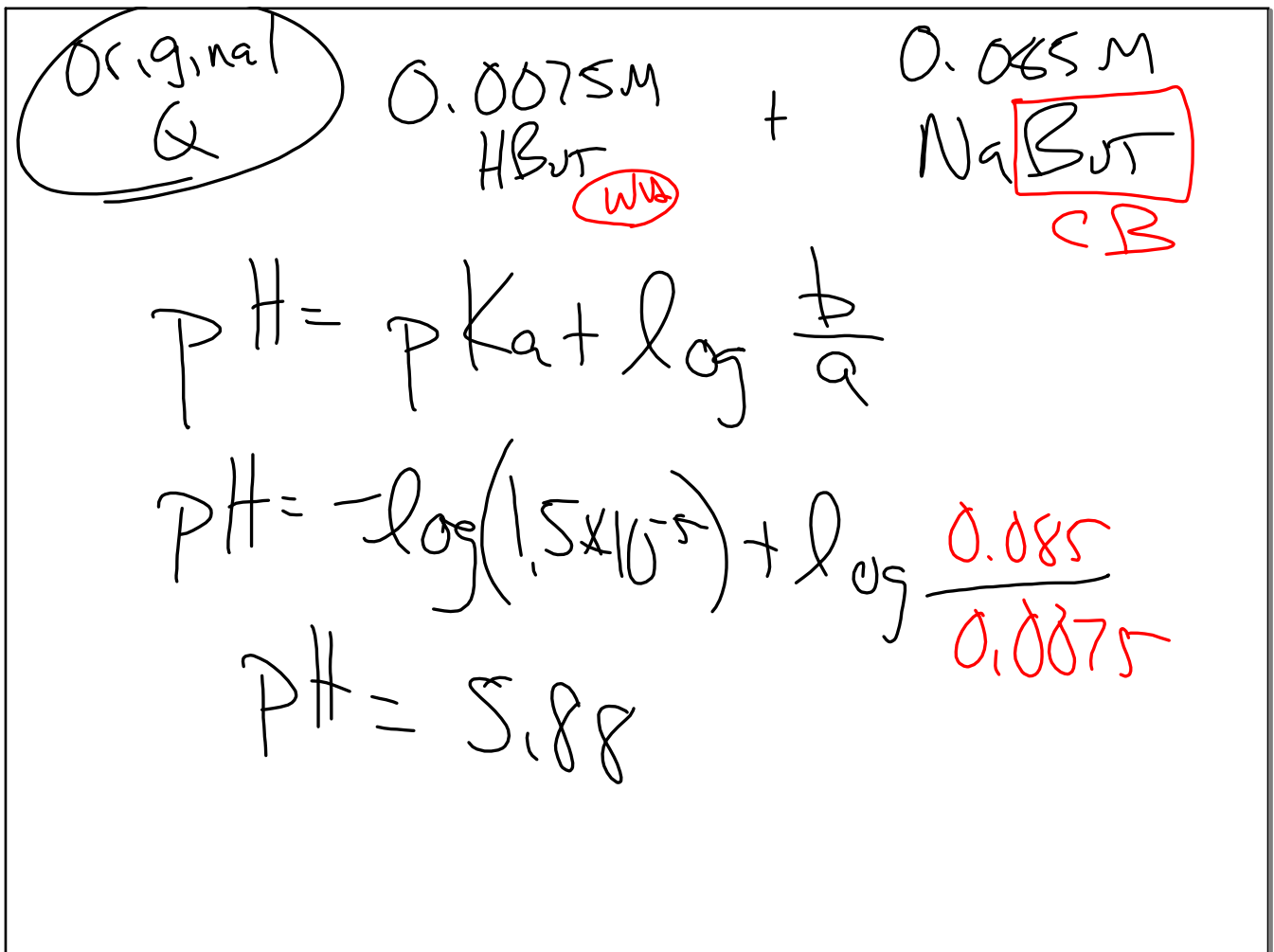
$$\frac{[\text{H}^+]}{1} = \frac{K_a [\text{HA}]}{[\text{A}^-]}$$

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

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

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

$\text{pH} = \text{p}K_a + \log \frac{\text{base}}{\text{acid}}$
H-H



Find pH 0.12M HLac + 0.1M NaLac
 $K_a = 1.4 \times 10^{-4}$ WA CB

Common ion

HLac	\rightleftharpoons	H^+	+	lac^-
I 0.12		x		0.1
E $0.12 - x$		x		$0.1 + x$

$NaLac \rightarrow Na^+ + lac^-$
 0.1 0.1 0.1

$K_a = \frac{x(0.1+x)}{(0.12-x)} = 1.4 \times 10^{-4}$

$x = 1.68 \times 10^{-4} = (H^+)$

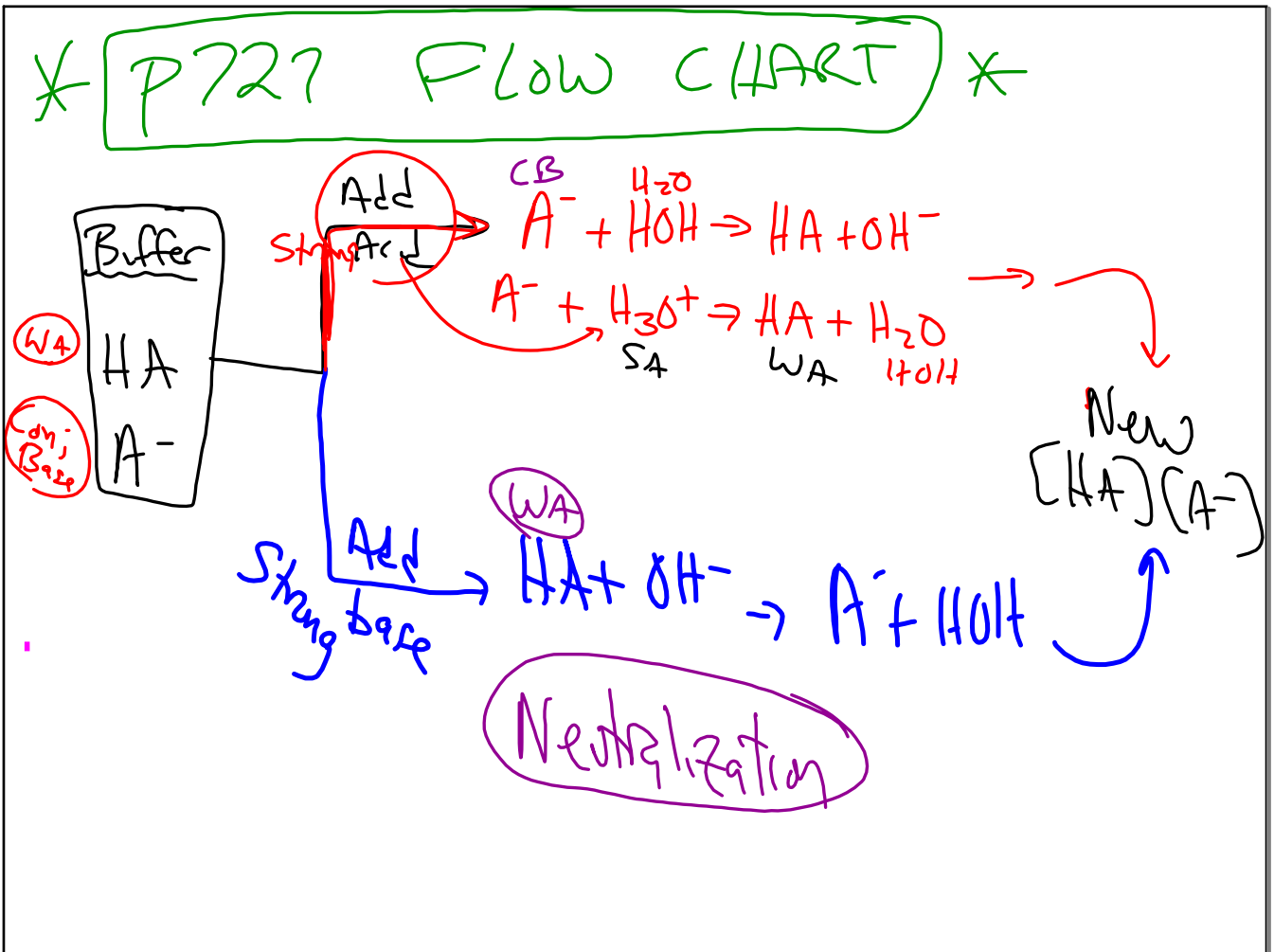
$pH = -\log(H^+) = 3.77$

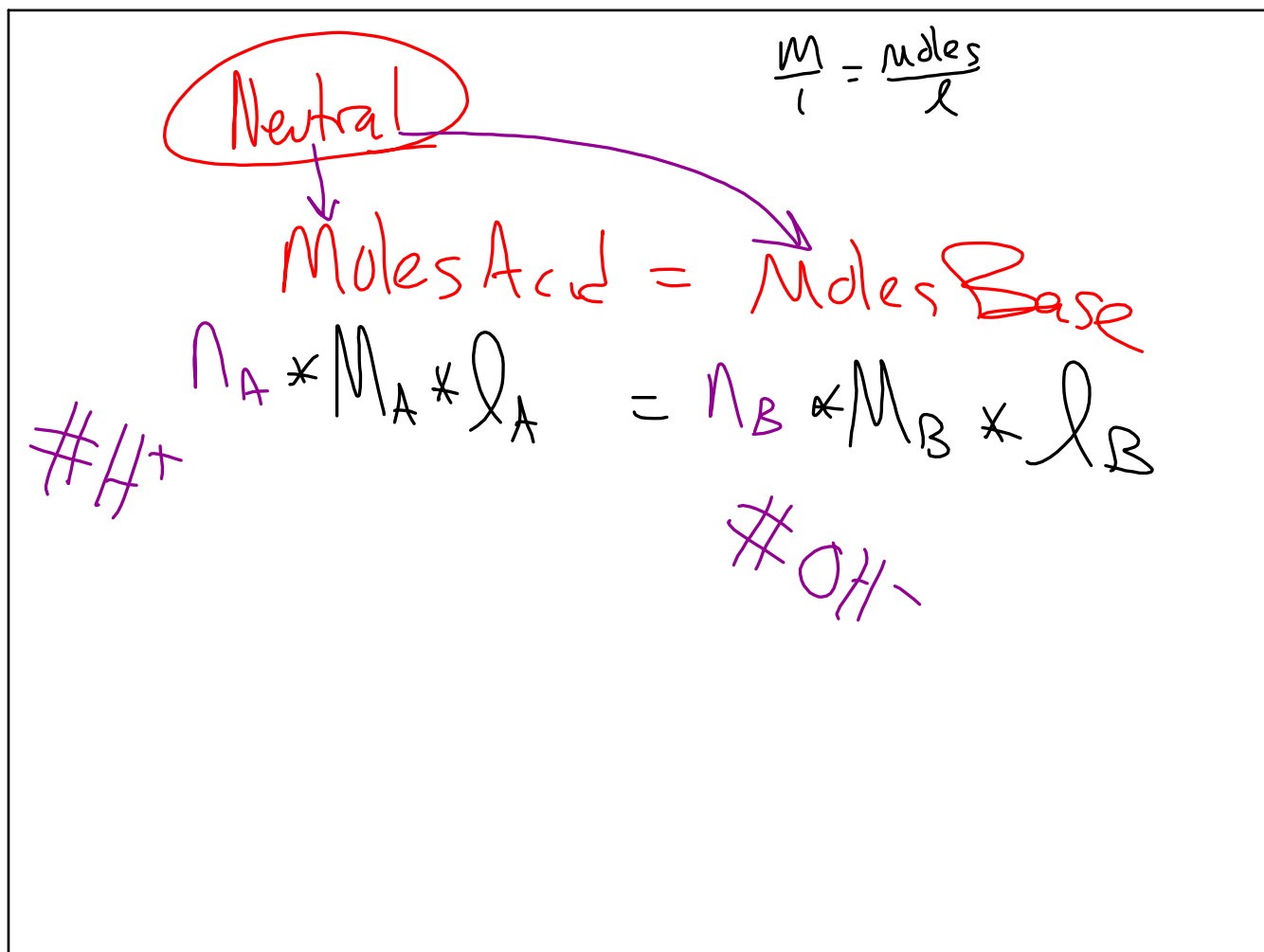
$pH = pK_a + \log \frac{\text{base}}{\text{acid}}$

$pH = -\log(1.4 \times 10^{-4}) + \log \frac{0.1}{0.12}$

pH = 3.77

¡es el mismo!





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