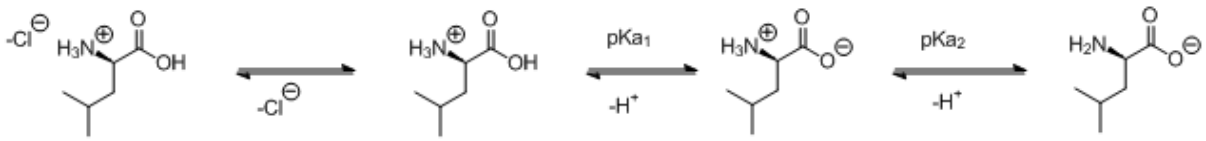
Answer on Question#69722 – Chemistry – Organic chemistry

Question: Find the percentage ionization of 0.001 M leucine hydrochloride if pKa1= 2.40 pKa2 = 9.60 please show me how to find it?

Solution:



$H_2L^+ = HL + H^+$

$Ka_1 = 10^{-pKa1} = 3.98 \times 10^{-3}$

$Ka_2 = 10^{-pKa2} = 2.5 \times 10^{-10}$

$Ka_1 >> Ka_2$ and the percent ionization is determined just the first stage of ionization.

	H_2L^+	⇌	HL	H^+
C_0, M	0.001		0	0
ΔC, M	- x		+ x	+ x
[], M	0.001 - x		x	x

$$0.00398 = \frac{x^2}{0.001 - x}$$

$$x^2 = 0.00398(0.001 - x)$$

$$x^2 + 0.00398x - 0.00000398 = 0$$

$$x = 8.28 \times 10^{-4}$$

$$percent\ ionization = \frac{8.28 \times 10^{-4}}{0.001} \times 100\% = 82.8\%$$

Answer: 82.8%