

general



$$K_b = \frac{[HB^+][OH^-]}{[B]} \quad pOH = 14 - pH$$

$$[OH^-] = 10^{-pOH}$$

the weaker the base, the stronger the conjugate acid

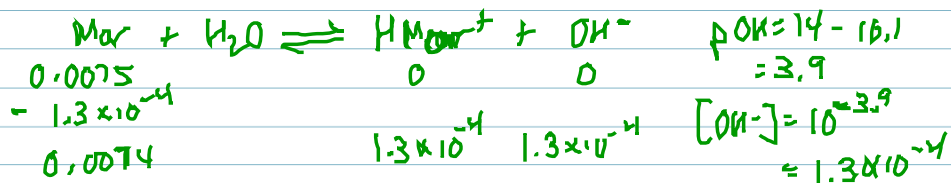
$$\text{conjugate pair } K_a + K_b = 10^{-14} \quad (K_w)$$

$$HF \quad K_a = 3.5 \times 10^{-4}$$

$$F^- \quad K_b = \frac{10^{-14}}{K_a} = \frac{10^{-14}}{3.5 \times 10^{-4}} = 2.9 \times 10^{-11}$$

Morphine $C_{17}H_{19}NO_3$ is an alkaloid (weak base)

If a 0.0075 M solution of morphine has a pH of 10.1, what is its K_b ?



$$K_b = \frac{(1.3 \times 10^{-4})^2}{0.0074} = 2.3 \times 10^{-6}$$

$$K_a \text{ HMor}^+ ? \quad \frac{10^{-14}}{2.3 \times 10^{-6}} = 4.3 \times 10^{-9}$$

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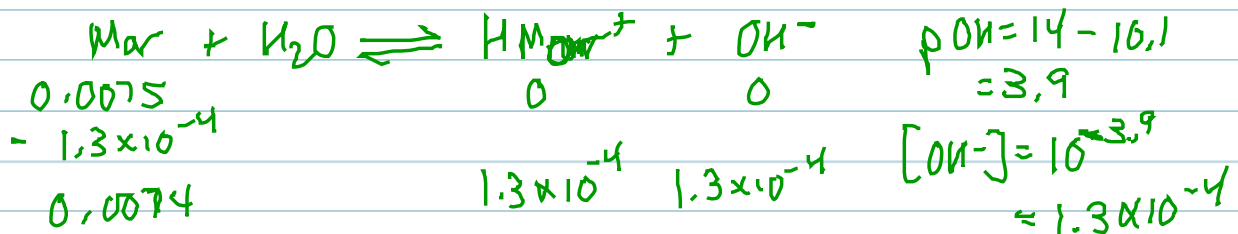
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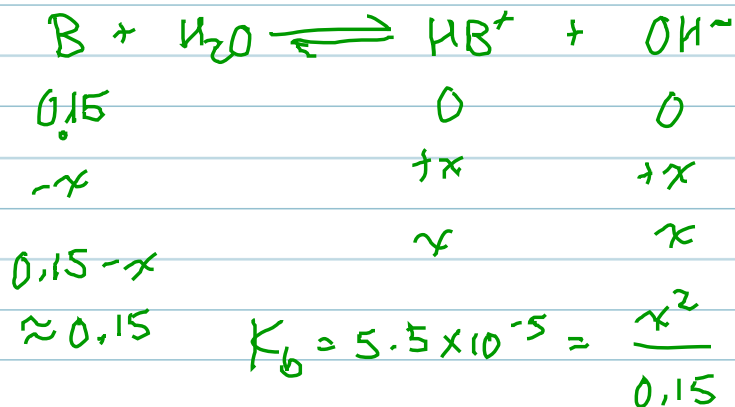


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A weak base similar to morphine has
a $K_b = 5.5 \times 10^{-5}$.

What is the $[OH^-]$, pOH , pH of a $0.15M$
solution of this base?



$$x = 0.0029M = [OH^-]$$

$$pOH = -\log(0.0029) = 2.54$$

$$pH = 14 - 2.54 = 11.46$$