

Chapter 16

#75) $[OH^-]$ given a $0.075 M$ solution & a $K_b = 6.4 \times 10^{-4}$

- Set up problem as usual.

$$6.4 \times 10^{-4} = \frac{X^2}{0.075} \quad \text{Solve for } X.$$

$$X = \sqrt{(0.075)(6.4 \times 10^{-4})} = 6.9 \times 10^{-3} = [OH^-]$$

plug into pOH & subtract from 14.

$$pH = ~~14~~ 14 - (-\log 6.9 \times 10^{-3}) = 11.84$$

Check for accuracy of our assumption.

$$\frac{6.9 \times 10^{-3}}{0.075} \times 100 = 9.2\% \quad \leftarrow \text{too large so we have to use quadratic formula.}$$

$$6.4 \times 10^{-4} = \frac{X^2}{0.075 - X} \rightarrow \boxed{X^2 + 6.4 \times 10^{-4} X - 4.8 \times 10^{-5} = 0}$$

A B C

use quadratic formula to solve this equation.

$$X = \frac{b \pm \sqrt{b^2 - 4ac}}{2a} \Rightarrow$$

$$X = \frac{6.4 \times 10^{-4} + \sqrt{(6.4 \times 10^{-4})^2 - 4(1)(4.8 \times 10^{-5})}}{2(1)} = 6.6 \times 10^{-3} = [OH^-]$$

$$pH = 14 - (-\log 6.6 \times 10^{-3}) = \boxed{11.82}$$

What a waste of time for 2/100 difference.