Consider the reaction $\text{IO}_4^-(aq) + 2\text{H}_2\text{O}(l) \rightleftharpoons \text{H}_4\text{IO}_6^-(aq)$; $K_c = 3.5 \times 10^{-2}$. If you start with 23.0 mL of a 0.903 M solution of NaIO$_4$, and then dilute it with water to 500.0 mL, what is the concentration of H$_4$IO$_6^-$ at equilibrium? Express your answer to two significant figures and include the appropriate units.

**Solution:**

\[ C_1V_1 = C_2V_2 \]
\[ C_2 = \frac{C_1V_1}{V_2} = \frac{(0.903 \text{ M})(23 \text{ mL})}{(500 \text{ mL})} = 0.0415 \text{ M} = \text{initial [IO}_4^-] \]

Molarity ............... $\text{IO}_4^- + 2\text{H}_2\text{O} \rightleftharpoons \text{H}_4\text{IO}_6^-$

Initial ............... 0.0415 ............... 0
Change ............... -x .................... +x
Final ............... 0.0415-x ............... x

\[ K_c = \frac{[\text{H}_4\text{IO}_6^-]}{[\text{IO}_4^-]} = 0.035 \]
\[ \frac{x}{(0.0415-x)} = 0.035 \]
\[ x = (0.035)(0.0415-x) \]
\[ x = 0.0015 - 0.035x \]
\[ 1.035x = 0.0015 \]
\[ x = 0.0014 \]

**Answer: 0.0014**