Sophia Chapter

Eq ⑦ Equilibrium Calculations (ICE) ③

* The dissociation of iodine occurs as following:

$I_{2(g)} \rightleftharpoons 2\,I_{(g)}$ $K_c = 3.8 \times 10^{-5}$ @ 1000 K.

what are the conc. of the gases if you start with 0.0456 mol I_2 in a 2.30 L flask?

$$\frac{0.0456}{2.30} = 0.0198\ M$$

Ans

$I_{2(g)} \rightleftharpoons 2\,I_{(g)}$

	I_2	I
I	0.0198	0
C	$-x$	$+2x$
E	$0.0198 - x$	$2x$

$$K_c = \frac{[I]^2}{[I_2]} \quad ; \quad 3.80 \times 10^{-5} = \frac{(2x)^2}{(0.0198 - x)}$$

$x^2 + x + ! = 0$

open up eq. $(3.80 \times 10^{-5})(0.0198 - x) = 4x^2$ ←

$$4x^2 + (3.80 \times 10^{-5})x - 7.52 \times 10^{-7} = 0$$

$a = 4$, $b = 3.80 \times 10^{-5}$, $c = -7.52 \times 10^{-7}$

quadratic calc. $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$$x = \frac{-3.80 \times 10^{-5} \pm \sqrt{(3.80 \times 10^{-5})^2 - 4(4)(-7.52 \times 10^{-7})}}{2(4)}$$

$$= \frac{(-3.80 \times 10^{-5}) \pm (3.47 \times 10^{-3})}{8}$$

$x = 4.29 \times 10^{-4}$ or ~~$x = -4.39 \times 10^{-4}$~~

at eq. $[I] = 2x = 2 \times 4.29 \times 10^{-4} = \boxed{8.58 \times 10^{-4}\ M}$

$[I_2] = 0.0198 - 4.29 \times 10^{-4} = \boxed{0.0194\ M}$