

Exercise ICE table:

### Exercise 7

Calculation~system not at equilibrium

At  $T = 0^\circ\text{C}$   
 $0.40 \text{ mol/L } \text{NOCl(g)}$



A system was charged with  $\text{NOCl}$  gas until its concentration reached  $0.400 \text{ mol L}^{-1}$ . The temperature of the system was then increased to  $245^\circ\text{C}$  and it was allowed to reach equilibrium according to equation. At equilibrium, the concentration of  $\text{Cl}_2$  was  $0.0225 \text{ mol L}^{-1}$ . Calculate the value of  $K_c$  at this temperature



Answer:

	$2\text{NOCl(g)} \rightleftharpoons \text{Cl}_2 \text{(g)} + 2\text{NO(g)}$		
[ ] initial	[ ]	[ ]	[ ]
[ ] change	[ ]	[ ]	[ ]
[ ] at equilibrium	[ ]	[ ]	[ ]

Given info:

$$[\text{Cl}_2]_{\text{eq}} = 0.0225 \text{ mol/L}$$

$$K_c = \frac{[\text{Cl}_2][\text{NO}]^2}{[\text{NOCl}]^2}$$

At equilibrium,

$$[\text{Cl}_2] \text{ is } 0.0225 \text{ mol/L} = x$$

$$\begin{aligned} [\text{NOCl}] &= 0.400 - 2x \\ &= \text{[ ] mol/L} \end{aligned}$$

$$\begin{aligned} [\text{NO}] &= 2x \\ &= \text{[ ] mol/L} \end{aligned}$$

Substitute the value of [ ] at equilibrium in the Kc formula

$$K_c = \frac{[ \quad ]^2}{[ \quad ]}$$
$$= \boxed{\quad}$$