

**Exercise 7**

Calculation~system not at equilibrium

A system was charged with NOCl gas until its concentration reached 0.400 mol L<sup>-1</sup>. The temperature of the system was then increased to 245°C and it was allowed to reach equilibrium according to equation. At equilibrium, the concentration of Cl<sub>2</sub> was 0.0225 mol L<sup>-1</sup>. Calculate the value of K<sub>c</sub> at this temperature

At T = 0s  
0.40 mol/L NOCl(g)

**Answer:**

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

Given info:

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

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

At equilibrium,

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

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

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

Substitute the value of [ ] at equilibrium in the K<sub>c</sub> formula

$$K_c = \frac{[ ]^{\square} [ ]^{\square}}{[ ]^{\square} [ ]^{\square}}$$

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