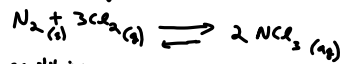


## Calculations With Mass Action Expression

1. Calculate  $K_{eq}$  given concentrations at equilibrium

a) At equilibrium - mol  $N_2 = 0.0070$   
 mol  $Cl_2 = 0.0022$   
 mol  $NCl_3 = 0.95$   
 Volume = 5.0 L

Find concentrations

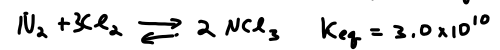
$$[N_2] = \frac{0.0070 \text{ mol}}{5.0 \text{ L}} = 0.0014 \text{ mol/L}$$

$$[Cl_2] = \frac{0.0022 \text{ mol}}{5.0 \text{ L}} = 0.00044 \text{ mol/L}$$

$$[NCl_3] = \frac{0.95 \text{ mol}}{5.0 \text{ L}} = 0.19 \text{ mol/L}$$

b.  $K_{eq} = \frac{[NCl_3]^2}{[N_2][Cl_2]^3} = \frac{(0.19)^2}{(0.0014)(0.00044)^3} = 3.0 \times 10^8$

2. Calculate equilibrium concentrations given...



$$[N_2] = 0.17 \text{ mol/L}$$

$$[Cl_2] = 0.51 \text{ mol/L}$$

$$[NCl_3] = ??$$

$$K_{eq} = \frac{[NCl_3]^2}{[N_2][Cl_2]^3} \quad 3.0 \times 10^{10} = \frac{[NCl_3]^2}{0.17 \times 0.51^3}$$

$$(3.0 \times 10^{10})(0.17)(0.51)^3 = [NCl_3]^2$$

$$\sqrt{6.8 \times 10^8} = \sqrt{[NCl_3]^2}$$

$$2.6 \times 10^4 = [NCl_3]$$

Read ch. 12 Questions 6-10, 14, 15  
 p. 499 & 508