

then the \_\_\_\_\_ reaction is favored  $\rightarrow$  more likely to happen

neither

reverse

forward



if  $[\text{NO}]$  is .0200M,  $[\text{Cl}_2]$  is .0250M,  
s .500M. Is the forward or reverse  
red?

$$\frac{2}{[\text{Cl}_2]} = \frac{[\text{NO}]^2}{[\text{Cl}_2]^2 [\text{NO}]^3} = \frac{[\text{NO}]^2}{[\text{Cl}_2]^2} = \frac{25000}{[\text{Cl}_2]^2}$$

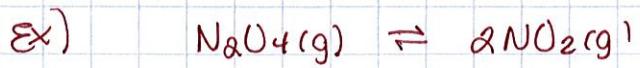
forward is favored



if  $[\text{O}_3]$  is  $1.6 \times 10^{-2}$  M. Is the forward  
action favored? reverse

$$\frac{3}{2} \left( \frac{1.6 \times 10^{-2} \text{ M}}{0.03 \text{ M}} \right)^2 = \frac{[\text{O}_2]^3}{[\text{O}_3]^2}$$

$$\sqrt[3]{0.00000793 \text{ M}^3} = \sqrt[3]{[\text{O}_2]^3}$$



$K_{\text{eq}} = .212^{\text{H}}$  and there is .04375 mol  $\text{NO}_2$  dissolved in .500L of solution at equilibrium. Calculate  $[\text{NaO}_4]$ . Which reaction is favored, forward or reverse?

$$K_{\text{eq}} = \frac{[\text{NO}_2]^2}{[\text{NaO}_4]}$$

$$.212 \text{ M} = \frac{(.0875 \text{ M})^2}{[\text{NaO}_4]}$$

$$\frac{M}{\text{NO}_2} = \frac{.04375 \text{ mol}}{.500 \text{ L}} \quad [\text{NaO}_4] \cdot .212 \text{ M} = \frac{(.0875 \text{ M})^2}{[\text{NaO}_4]} \cdot [\text{NaO}_4]$$

$$M = .0875 \text{ M}$$

$$\frac{[\text{NaO}_4] \cdot .212 \text{ M}}{.212 \text{ M}} = \frac{(.0875 \text{ M})^2}{.0875 \text{ M}}$$

$$[\text{NaO}_4] = .0361 \text{ M}$$

## Le Chatelier's Principle

You can "force" a reversible reaction to either go in the forward or reverse direction by stressing the equilibrium

Le Chatelier's Principle - a stress applied to a system at equilibrium will shift the position of equilibrium in order to reduce the stress.

Type of Stress	Equilibrium shifts...	Why?
↑ [Reactant] (g or aq)	right (forward)	to use up the extra reactant
↓ [Reactants]	left (reverse)	to make more reactant
↑ [Product]	left (reverse)	to use up the extra product
↓ [Product]	right (forward)	to make more Product
↑ temperature	away from q (heat)	to lower temp
↓ temperature	toward q (heat)	to increase kemp.
↑ volume (P↓)	toward the side w/more moles of gas	to increase P
↓ volume (P↑)	toward the side w/less moles of gas	to decrease P
add a catalyst		no shift
Ex) $Q + 3NO(g) \rightleftharpoons NO_2(g) + NaO(g)$ Q is +		
(A) ↑ [NO <sub>2</sub> ] L		(E) ↓ [NaO] R
(B) ↑ T R		(F) ↓ T L
(C) ↓ V R		(G) add a catalyst no shift
(D) ↑ [NO] L		(H) ↑ V L