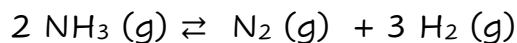


Calculation of K_c/K_p

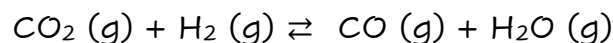
1. Calculate K_p for the following reaction at 125°C.



The equilibrium pressures are: $P_{\text{NH}_3} = 0.541 \text{ atm}$, $P_{\text{N}_2} = 3.73 \text{ atm}$, and $P_{\text{H}_2} = 11.2 \text{ atm}$

$$K_p = \frac{P_{\text{H}_2}^3 P_{\text{N}_2}}{P_{\text{NH}_3}^2} = \frac{(11.2)^3 \times (3.73)}{(0.541)^2} = 1.79 \times 10^4$$

2. Consider the following reaction at 100°C. The initial concentration of $[\text{CO}_2] = 0.325 \text{ M}$ and $[\text{H}_2] = 0.0768 \text{ M}$. The equilibrium concentration of $[\text{CO}] = 0.0221 \text{ M}$.



a) Write an ICE table.

	$\text{CO}_2 (\text{g})$	$+$	$\text{H}_2 (\text{g})$	\rightleftharpoons	$\text{CO} (\text{g})$	$+$	$\text{H}_2\text{O} (\text{g})$
I	0.0821 M		0.0768 M		0		0
C	-x		-x		+x		+x
E	0.0821 - x		0.0768 - x		x		x

$$x = 0.0221 \text{ M}$$

b) Calculate the equilibrium concentrations of each species.

$$[\text{CO}_2]_{\text{eq}} = 0.0821 \text{ M} - 0.0221 \text{ M} = 0.0600 \text{ M}$$

$$[\text{H}_2]_{\text{eq}} = 0.0768 \text{ M} - 0.0221 \text{ M} = 0.0547 \text{ M}$$

$$[\text{CO}]_{\text{eq}} = [\text{H}_2\text{O}]_{\text{eq}} = 0.0221 \text{ M}$$

c) Calculate K_c .

$$K_c = \frac{[\text{CO}][\text{H}_2\text{O}]}{[\text{CO}_2][\text{H}_2]} = \frac{(0.0221)(0.0221)}{(0.0600)(0.0547)} = 1.43 \times 10^{-1} \text{ M}$$

d) Are there more reactants or products at equilibrium?
reactants