PBL project:

May I Take Your (Reaction) Order?

Assigned Tasks

1. Determine the order of your reaction.
2. Determine the rate constant at a few selected temperatures
3. Determine the activation energy of your reaction

EXTRA CREDIT

Determine the frequency factor (A)

Manipulating the Equilibrium Constant.

1. When reactions are added, their equilibrium constants are multiplied
2. When you multiply a reaction by a constant, you raise the equilibrium constant to that power.
3. When you reverse the direction of a reaction, you take the reciprocal of its equilibrium constant.

$$2A + B \rightleftarrows 3C$$

$$K_c = \frac{[C]_{eq}^3}{[A]_{eq}^2 [B]_{eq}}$$

$$4A + 2B \rightleftarrows 6C$$

$$K_c' = \frac{[C]_{eq}^6}{[A]_{eq}^4 [B]_{eq}^2}$$

$$= \left(\frac{[C]_{eq}^3}{[A]_{eq}^2 [B]_{eq}} \right)^2$$

$$K_c' = K_c^2$$

$\sqrt{x}$

$\sqrt{x} \cdot \sqrt{x} = x$

$x^{\frac{1}{2}} \cdot x^{\frac{1}{2}} = x^{\frac{1}{2}+\frac{1}{2}} = x^{1}$

$= x$

$$2A + B \rightleftarrows 3C$$

$$K_c = \frac{[C]_{eq}^3}{[A]_{eq}^2 [B]_{eq}}$$

$$3C \rightleftarrows 2A + B$$

$$K_c'' = \frac{[A]_{eq}^2 [B]_{eq}}{[C]_{eq}^3}$$

$$= \frac{1}{\frac{[C]_{eq}^3}{[A]_{eq}^2 [B]_{eq}}}$$

$$= \frac{1}{K_c}$$

$2A(g) \rightleftarrows B(g) + C(g)$

We start with only gas A in the reaction vessel at a concentration of $1.50\ mol\ L^{-1}$. At equilibrium, the concentration of gas B is $0.50\ mol\ L^{-1}$. What is the numerical value of K_c for this reaction?

	[A]	[B]	[C]
I	1.50	0	0
C	-1.00	+0.50	+0.50
E	0.50	0.50	0.50

$$I + C = E$$

$$2A \rightleftarrows B + C$$

$$K_c = \frac{[B]_{eq}[C]_{eq}}{[A]_{eq}^2}$$

$$= \frac{(0.50)(0.50)}{(0.50)^2} = 1.0$$

Reaction Quotient:

$$aA + bB \rightleftarrows cC + dD$$

$$Q_c = \frac{[C]^c [D]^d}{[A]^a [B]^b}$$

$$K_c = \frac{[C]_{eq}^c [D]_{eq}^d}{[A]_{eq}^a [B]_{eq}^b}$$