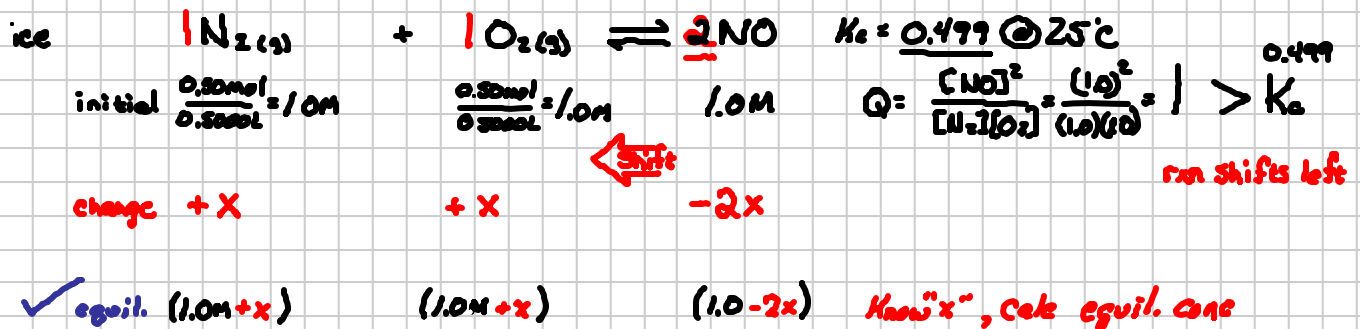


Lecture 9.1 Determining Equilibrium Levels

Note Title

9/27/2011

Example: 0.50 moles of N_2 , O_2 & NO are placed in a 500.0 mL (0.5000 L) container. The mixture reaches equilibrium via the equilibrium reaction below. What are the equilibrium concentrations for all species?



Law of mass action:

$$K_c = \frac{[NO]_e^2}{[N_2]_e [O_2]_e}$$

$$0.499 = \frac{(1.0 - 2x)^2}{(1.0 + x)(1.0 + x)}$$

$$0.499 = \frac{(1.0 - 2x)^2}{(1.0 + x)^2}$$

$$\sqrt{0.499} = \sqrt{\left(\frac{1.0 - 2x}{1.0 + x}\right)^2}$$

$$0.706399 = \frac{1.0 - 2x}{1.0 + x} \Rightarrow (0.706399)(1.0 + x) = 1.0 - 2x$$

$$0.2936 = 2.706399x$$

$$0.10848 = x \quad \odot$$

Equilibrium conc

$$[N_2]_e = 1.0 + x = 1.0 + x = 1.10848 = 1.1 M$$

$$[O_2]_e = 1.0 + x = 1.0 + x = 1.10848 = 1.1 M$$

$$[NO]_e = 1.0 - 2x = 1.0 - 2(0.10848) = 0.783 = 0.8 M$$

Check work

$$Q = \frac{[NO]^2}{[N_2][O_2]} = \frac{(0.783)^2}{(1.10848)(1.10848)} = 0.499 \odot = 0.499$$

yes! equil conc