5/8/20

Quiz 2 Topics

- Reaction Coordinate diagram
- Reaction progress diagram
- Equilibrium – 3 definitions
- K and Q
- Is Q=K?
- Writing equilibrium constants
  - $K = \frac{[C]^c[D]^d}{[A]^a[B]^b}$
  - no activity
  - pure solids or liquids
- K_c vs K_p
- no ICE
- no K_a

$2\,NO(g) + O_2(g) \rightleftharpoons 2\,NO_2(g)$

$$K_p = \frac{P_{NO_2}^2}{P_{NO}^2 \cdot P_{O_2}}$$

$PV = nRT \qquad nRT = PV$

$$\left(\frac{n}{V}\right) = \frac{P}{RT} = [X]$$

$$K_c = \frac{[NO_2]^2}{[NO]^2[O_2]} = \frac{\left(P_{NO_2} \cdot \frac{1}{RT}\right)^2}{\left(P_{NO} \cdot \frac{1}{RT}\right)^2 \left(P_{O_2} \cdot \frac{1}{RT}\right)}$$

$$= \left(\frac{P_{NO_2}^2}{P_{NO}^2 \cdot P_{O_2}}\right) \cdot \frac{(1/RT)^2}{(1/RT)^2 (1/RT)}$$

$$K_c = K_p \cdot \frac{(1/RT)^{\text{2 moles of product}}}{(1/RT)^{\text{3 moles of reactant}}}$$

$$K_c = K_p \cdot (1/RT)^{2-3} = K_p \cdot (1/RT)^{-1}$$

$$= K_p \cdot RT$$

In general:

$$K_c = K_p \cdot (1/RT)^{\Delta n}$$

$$K_p = K_c \cdot (RT)^{\Delta n}$$

Δn: difference in moles of products and moles of reactants

$$\Delta n = n_{products} - n_{reactants}$$