Quiz 5

1. a) $K >> 1$.

$$P_{nx} \underset{k_2}{\overset{K\ k_1}{\rightleftharpoons}} n P_x^-$$

at equilibrium

$$k_1[P_{nx}] = k_2[P_x]^n$$

$$\Rightarrow \frac{k_1}{k_2} = K = \frac{([P_x])^n}{[P_{nx}]}$$

$$\Rightarrow [P_x]^- = (K[P_{nx}])^{1/n} \quad \because K >> 1 \Rightarrow [P_{nx}] << [P_x]$$

n initiato molecules make 1 inactive P_{nx}

$$[P_x^-] + n[P_{nx}] = [I]_0 \Rightarrow [P_x^-] = [I]_0$$

$$r_p = -\frac{1}{V}\frac{dM}{dt} = k_p[M][P_x]^1$$

$$= k_p[M][I]_0$$

b) $M = M_0(1-2x)$

$$dM = M_0(-2)dx = -2M_0 dx$$

$$\Rightarrow -\frac{1}{V}\frac{M_0(-2)\,dx}{dt} = k_p \frac{M_0(1-2x)}{V}[I]_0$$

$$\Rightarrow \frac{dx}{1-2x} = k_p[I]_0\,dt$$

$$\Rightarrow -\frac{1}{2}\ln(1-2x) = k_p[I]_0 t + C \quad , \text{ at } t=0 \quad x=0 \Rightarrow C=0$$

$$\Rightarrow \ln(1-2x) = -2k_p[I]_0 t$$

$$\Rightarrow 1-2x = \exp(-2k_p[I]_0 t)$$

$$\Rightarrow x = \frac{1}{2}(1-\exp(-2k_p[I]_0 t))$$