Date Planned : __ / __ / __	Daily Tutorial Sheet-15	Expected Duration : 90 Min
Actual Date of Attempt : __ / __ / __	Level-3	Exact Duration :_____

159. The density of an equilibrium mixture of N_2O_4 and NO_2 at 1atm and 373.5K is 2.0g/L. Calculate K_C for the reaction $N_2O_4(g) \rightleftharpoons 2NO_2(g)$.

160. Calculate the equilibrium concentration ratio of C to A if equimolar ratio of A and B were allowed to come to equilibrium at 300 K.

$$A(g) + B(g) \rightleftharpoons C(g) + D(g);\ \Delta G^\circ = -830\,\text{cal}.$$

161. A 250 mL flask, and 100 mL flask are separated by a stop cock. At 350K, the nitric oxide in the larger flask exerts a pressure of 0.46 atm and the smaller one contains oxygen at 0.86atm. The gases are mixed by opening the stop cock. The reactions occurring are

$$2NO + O_2 \longrightarrow 2NO_2 \rightleftharpoons N_2O_4$$

The first reaction is complete while the second one is at equilibrium. Assuming all the gases to behave ideally, calculate the K_p for the equilibrium reaction if the final total pressure is 0.37atm.

162. Solid NH_4I upon rapid heating in a closed vessel at 357°C develops a constant pressure of 275mm Hg owing to the partial decomposition of NH_4I into NH_3 and HI but the pressure gradually increase further (when excess solid residually remain in the vessel) owing to the dissociation of HI. Calculate the final pressure developed under equilibrium.

$$NH_4I(s) \rightleftharpoons NH_3(g) + HI(g)$$

$$2HI(g) \rightleftharpoons H_2(g) + I_2(g),\ K_P = 0.015 \text{ at } 357^\circ C.$$

163. A container whose volume is V, contains an equilibrium mixture that consists of 2 moles each of PCl_5, PCl_3 and Cl_2 (all gases). The pressure is 30.3975 kPa and temperature is T. A certain amount of $Cl_2(g)$ is now introduced keeping the pressure, and temperature constant until the equilibrium volume changes to 2V. Calculate the amount of Cl_2 that was added and the value of K_p.

164. PCl_5 dissociates into PCl_3 and Cl_2 as $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$

If the total pressure of the system in equilibrium is P at a density ρ and temperature T, show that Degree of dissociation $\alpha = \dfrac{PM}{\rho RT} - 1$ where M is the relative molar mass of PCl_5. If the vapour density of the gas mixture at equilibrium has the value of 62 when the temperature is 230°C, what is the value of P/ρ?