1. An equilibrium was established in a 1.00 L reaction vessel at 250 °C. The initial concentration of $PCl_{5(g)}$ was 0.861 mol/L. The vessel was found to contain 0.257 mol/L of chlorine gas at equilibrium.

$$PCl_{5(g)} \rightleftharpoons PCl_{(g)} + 2\ Cl_{2(g)}$$

Calculate K_c for the reaction at this temperature. ***(0.0116)***

2. 0.563 mol/L of $HI_{(g)}$ was placed in a 1.00 L reaction vessel. The temperature was raised to 300 °C and maintained until equilibrium was established. At equilibrium the vessel was found to contain 0.158 mol/L each of hydrogen and iodine.

$$H_{2(g)} + I_{2(g)} \rightleftharpoons 2\ HI_{(g)}$$

Calculate the value for K_c for this equilibrium. ***(2.44)***

3. Bromine chloride, $BrCl_{(g)}$ decomposes to form its elements. 0.537 mol/L of $BrCl_{(g)}$ and 0.100 mol/L of $Cl_{2(g)}$ were placed in a closed container and allowed to establish an equilibrium at 200 °C. The equilibrium concentration of chlorine gas was measured to be 0.215 mol/L.

$$2\ BrCl_{(g)} \rightleftharpoons Br_{2(g)} + Cl_{2(g)}$$

Determine K_c for this equilibrium. ***(0.262)***

4. The decomposition of nitrogen monoxide gives this equilibrium:

$$2\ NO_{(g)} \rightleftharpoons N_{2(g)} + O_{2(g)}$$

Initially 0.867 mol/L of $NO_{(g)}$ was placed in a 1.0 L sealed flask at 500 °C. If the percent reaction of $NO_{(g)}$ is 35 %, calculate K_c. ***(0.0725)***

5. In a 1.00 L vessel, 0.500 mol of nitrogen gas and 0.500 mol of oxygen gas were reacted at 773 K to produce nitrogen monoxide gas. The percent reaction was found to be 20.0%.

$$N_{2(g)} + O_{2(g)} \rightleftharpoons 2\ NO_{(g)}$$

Calculate the equilibrium concentrations of all three species.

(N_2 & O_2 = 0.4 mol/L: NO = 0.2 mol/L)

6. An equilibrium was established in a 1.00 L container when 0.700 mol of phosphorus pentachloride gas was decomposed at 500 K. At equilibrium, the concentration of chlorine gas was 0.0740 mol/L. ***(2.43×10^{-11})***

$$4\ PCl_{5(g)} \rightleftharpoons P_{4(s)} + 10\ Cl_{2(g)}$$

Calculate the equilibrium constant for this system.