**Equilibrium Kp**

Kp is the equilibrium constant when working with gaseous substances. The expression is written in a similar way to Kc but we use normal brackets as we are not working with concentration.

E.g. 2SO2(g) + O2(g) ⇌ 2SO3(g) Pressure in atm

Write the Kp expression for the following reaction

 N2(g) + 3H2(g) ⇌ 2NH3(g) Pressure in kPa

Only gases are included in the Kp expression

E.g. CaCO3(s) ⇌ CaO(s) + CO2(g) Pressure in atm

**Calculating Kp**

In a mixture of gases each individual gas will exert a partial pressure. The sum of all the partial pressures is equal to the total pressure.

In the mixture, each component also makes up a fraction of the total moles. This is the mole fraction.

Partial pressure = mole fraction x total pressure

1. 1.0 mol of PCl5 were heated in a sealed container to 500K. The equilibrium mixture, at a pressure of 625 kPa, contained 0.6 mol Cl2. Calculate Kp.

PCl5(g) ⇌ PCl3(g) + Cl2(g)

1. 2.0 mol of sulfur dioxide and 1.0 mol of oxygen were mixed and allowed to reach equilibrium at a pressure of 500000 Pa. The mixture was found to contain 0.67 mol of oxygen. Calculate Kp.

2SO2(g) + O2(g) ⇌2SO3(g)

1. 2.0 mol of X were heated to 2000°C until equilibrium was established at a pressure of 8 x 107 Nm-2. At equilibrium, X was found to have undergone 20% dissociation. Calculate Kp.

X(g) ⇌ Y(g) + 2Z(g)

1. In the following reaction at 700K, the amount of each gas present at equilibrium was 0.96 mol of NO2, 0.04 mol of NO and 0.02 mol of O2. If Kp = 6.8 x 10-6 atm, what must the total pressure have been to achieve this particular equilibrium mixture?

2NO2(g) ⇌ 2NO(g) + O2(g)

