Definitions and Concepts for Edexcel Chemistry A-level

Topic 11: Equilibrium 2

Mole fraction of gas: Number of moles of particular gas / Total number of moles of all gases in the mixture.

Partial pressure: The pressure exerted by a particular gas in a mixture in a closed system. Relation to mole fraction: Mole fraction x Total pressure = Partial pressure.

Total pressure: Sum of all partial pressures.

To illustrate the above concepts, let's suppose we have a mixture of nitrogen, oxygen and argon in a closed system at certain conditions. The mixture consists of **0.005 moles of N_2, 0.010 moles of O_2, and 0.020 moles of Ar.** The total pressure within the container is **140 bars**.

Hence, the total number of moles of our gases is 0.005 + 0.010 + 0.020 = **0.035 mol**

The mole fractions of gases are:

Nitrogen; 0.005/0.035 = **1/7**

Oxygen; 0.010/0.035 = **2/7**

Argon; 1 - (1/7 + 2/7) = **4/7**, or 0.020/0.035 = **4/7**.

Therefore, partial pressures exerted by each gas are:

Nitrogen; (1/7) x 140 = **20 bar**

Oxygen; (2/7) x 140 = **40 bar**

Argon; 140 - (20 + 40) = **80 bar**, or (4/7) x 140 = **80 bar**

Reaction quotient vs Kc, Kp: The important point to note is that the values appearing in the reaction quotient may not be the values corresponding to the system in equilibrium. Only at equilibrium is the reaction quotient the same as the equilibrium constant.