**Factors Affecting Equilibrium**

Kc and Kp are constant at a particular temperature. If we change any other conditions, the position of equilibrium will shift in order to keep Kc or Kp constant.

*From GCSE*

What would happen to the position of equilibrium in the below reaction if a) temperature were increased and b) pressure were increased?

2SO2(g) + O2(g) ⇌ 2SO3(g) ∆H = -197.8 kJmol-1



**Concentration**

A + B ⇌ X + Y

Kc = [X][Y]



[A][B]

If we increase the concentration of X, the numerator will become larger and so Kc should increase.

However, Kc is constant so instead, the equilibrium shifts left to produce more A and B. Overall, the value of Kc does not change.

**Pressure**

N2 + 3H2 ⇌ 2NH3

At GCSE we learn that if we increase the pressure in the above system, the equilibrium shifts right, producing more NH3

Kp = (PNH3)2 We calculate partial pressure by

(PN2)(PH2)3 multiplying mole fraction by total pressure

Kp = MF(NH3)2 X (Ptot)2



MF(N2)MF(H2)3 (Ptot)4



When pressure is increased, equilibrium shifts right, the MF of NH3 increases and the numerator becomes larger. But, the total pressure has also increased, making the denominator larger. Overall, the value of Kp does not change.

**Temperature**

This is the only factor that does affect the position of equilibrium. The effect depends on the endothermic/exothermic nature of the reaction

N2 + 3H2 ⇌ 2NH3 ∆H = -92 kJmol-1

Kp = (PNH3)2

(PN2)(PH2)3



If the temperature is increased, the equilibrium shifts left to favour the reverse, endothermic reaction. More N2 and H2 are produced, the denominator becomes larger and Kp decreases.