



**Chemical Equilibrium**  
**Chemistry – Leaving Cert**  
**Quick Notes**

# Chemical Equilibrium

Chemical equilibrium is a state of dynamic balance where the rate of the forward reaction equals the rate of the background reaction. Since reactions at equilibrium have not gone to completion, both reactants and products will be present at equilibrium. Le Chatelier's Principle states that if a stress is applied to a system at equilibrium, the system readjusts to relieve the stress applied. A stress may be a change in pressure, temperature or concentration e.g. a temperature increase causes the reaction to go in the endothermic direction. A change in pressure will only have an effect all the substances are gases and if the total number of molecules on the left hand side of the equation is different to that on the right-hand side. A catalyst has no effect on the position of equilibrium but changes the amount of time it takes for the system to reach a state of equilibrium. Le Chatelier's Principle may be investigated using three specific reactions. The Haber Process involves the manufacture of ammonia by combining nitrogen with hydrogen using an iron catalyst. To get the best yield of ammonia, the reaction is carried out at 200 atmospheres and 500°C. The contact process is a method to produce sulphuric acid using vanadium pentoxide as a catalyst. Optimum conditions for this reaction would be high pressure and low temperature but these are difficult to achieve so compromises are made to get the best yield of sulphuric acid. The equilibrium constant relates the concentration of the reactants with the products in an equilibrium mixture. It is denoted by  $K_c$  and it is calculated by multiplying the concentration of the products and dividing this by the product of the concentrations of the reactants. The larger the  $K_c$ , the greater the extent to which the reaction has gone to completion.  $K_c$  is only constant if the temperature does not change.