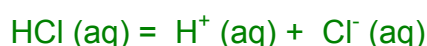
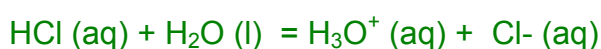


Acids and Bases

If you've ever seen the film 'Alien', you might remember the 'molecular acid' that fell between the decks of the spaceship when the little beastie was being dissected. The reality is not quite as dramatic but does have its moments!

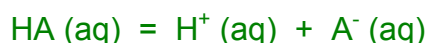
Acids are 'Jeckyl and Hyde' substances. They are indeed molecular, held together by covalent bonds and yet when immersed in water they ionise releasing H^+ ions (more accurately H_3O^+ ions). They do this because they have strongly polar bonds involving $H^{\delta+}$, either O-H as in sulphuric or nitric acids or perhaps Cl-H as in hydrochloric acid. The water molecules are able to solvate these ions stabilising the system i.e. lowering the energy.



Hydrogen chloride is a molecular gas, which dissociates in water. As the stabilisation of ions is considerable the dissociation is complete and HCl is described as a strong acid. The first equation is more accurate but the second is quite acceptable.

This stabilisation is the key. The more the ions are stabilised relative to the parent molecule, the more the dissociation will take place and the 'stronger' the acid. If the advantage is small the acid is weak. **Most acids are weak** and strong acids, which completely dissociate, comprise only a handful. This way of looking at acids is the Bronsted-Lowry definition, or acids as proton donors.

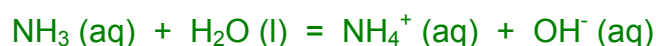
To quantify this for weak acids we use another equilibrium constant, K_a – the acid dissociation constant



$$K_a = \frac{[H^+][A^-]}{[HA]}$$

Note that the units here will be mol dm^{-3} , and that values can be anywhere in the region of 10^{-7} to about 1. The smaller the number, the weaker the acid.

Bases are, of course, proton acceptors. This really means forming hydroxide ions, which pick up a proton to become water molecules. Often the hydroxide ions are supplied direct such as in the strong bases NaOH and KOH. But there are also weak bases that react with water to form hydroxide indirectly e.g. ammonia.



This can be generalised for any weak base...

Dissociation
Of
Hydrogen

Dissociation
Constants
 K_a and K_b