

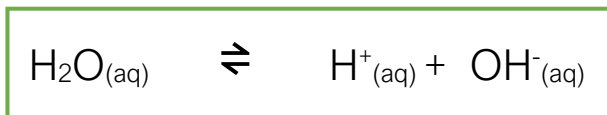
The Effect of Temperature on pH

A very common misconception regarding pH is that neutral solutions are defined as those with a pH of 7. This seems to be drummed into school students so much that it's hard to stop them believing this definition.

It is true that a solution is neutral when the pH is 7, **but only at 25°C!**

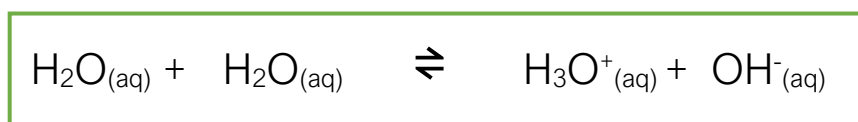
The pH of a neutral solution varies significantly if the temperature rises or falls.

Consider the following equilibrium:



We could assume that the $\Delta H = +ve$ (endothermic in forwards direction) as bonds have been broken.

The Lowry-Brønsted equation for this is:



It's not quite as clear-cut when we represent this in Lowry-Brønsted equation as a bond was broken in the H_2O molecule, but a bond was made in the H_3O^+ ion. But this bond that is formed is very weak as you may intuitively suspect. This process is, indeed, **endothermic in the forward direction**.

Le Chatelier's Principle would predict that a rise in temperature would shift the equilibrium to the right-hand side leading to greater dissociation of water molecules.

The **$[\text{H}^+]$ must rise and the pH must fall!** BUT, you must not assume that a fall in pH means that the solution becomes acidic.

It remains **neutral** because **$[\text{H}^+] = [\text{OH}^-]$** . Both values are bigger.

Some examples of pH at different temperatures

Temperature/°C	pH
0	7.47
25	7.00
50	6.63
100	6.14

