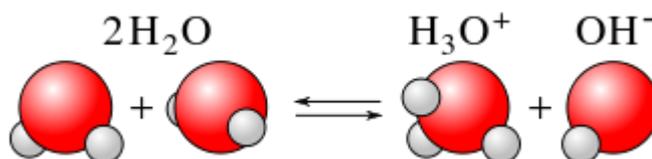


### Question #48299, Chemistry, Inorganic Chemistry

why water maintains PH under Auto-ionization?

**Answer:**

Autoionization is the "breaking apart" of water molecules to form H<sup>+</sup> and OH<sup>-</sup>. For each water molecule you get a balance between "acid" and "base" making the water neutral. The concentrations of H<sup>+</sup> (1.00x10<sup>-7</sup>) and OH<sup>-</sup> (1.00x10<sup>-7</sup>) are what give water its pH of 7.00 at 25°C.



At standard temperature and pressure (STP), the equilibrium constant of water,  $K_w$ , is equal to

$$K_w = [\text{H}_3\text{O}^+][\text{OH}^-]$$

$$K_w = [1.0 \times 10^{-7}][1.0 \times 10^{-7}]$$

$$K_w = 1.0 \times 10^{-14}$$

In this equation  $[\text{H}_3\text{O}^+]$  is the concentration of hydronium ions, which in a chemical equation is the acid constant,  $K_a$ . The  $[\text{OH}^-]$  is the concentration of hydroxide ions, which in a chemical equation is the base constant,  $K_b$ . If given a pH, then you can easily calculate the  $[\text{H}_3\text{O}^+]$  by simply taking the negative reverse log of the pH:

$$[\text{H}_3\text{O}^+] = 10^{-\text{pH}}$$

The same formula applies to obtaining  $[\text{OH}^-]$  from the pOH:

$$[\text{OH}^-] = 10^{-\text{pOH}}$$

Adding the pH's gives you the  $\text{p}K_w$

$$\text{p}K_w = \text{pH} + \text{pOH} = 14.00$$