Calculate $[H_3O^+]$ and $[OH^-]$ for a solution with pH=6.0

Solution:

The pH formula is:

$pH=-\log_{10}[H_3O^+]$;

We can directly calculate the $[H_30^+]$ value by expressing it from the formula above:

$[H_3O^+]=10^{-pH}=10^{-6}$ mol/L;

The $[H_3O^+]$ and $[OH^-]$ concentrations are bind through ionization constant of water, K_w:

$K_w = [H_3O^+]*[OH^-]$;

Then, the concentration of $[OH^-]$ is equal to:

$[OH^-]=\frac{K_w}{[H_3O^+]}=\frac{10^{-14}}{10^{-6}}=10^{-8}$ mol/L;

(As the temperature not specified, we assume that K_w is equal to 10^{-14} – this is the value of constant at 25°C)

Answer:

$[H_3O^+]=10^{-6}$ mol/L; $[OH^-]=10^{-8}$ mol/L;