

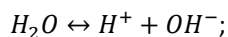
Calculate the pH and $\{OH^{-}\}$ of solution with $\{H^{+}\}=4.2 \times 10^{-9}$.

Solution

Find the pH of this solution:

$$pH = -\lg\{H^{+}\} = -\lg(4.2 \cdot 10^{-9}) = 8.377$$

Water molecules auto-dissociate into $\{H^{+}\}$ and $\{OH^{-}\}$ ions in the following equilibrium:



The concentration product of these ions in water solution is constant:

$$\{H^{+}\} \cdot \{OH^{-}\} = 1 \cdot 10^{-14} \text{ M}^2;$$

So, if $\{H^{+}\} = 4.2 \cdot 10^{-9} \text{ M}$:

$$\{OH^{-}\} = \frac{1 \cdot 10^{-14}}{\{H^{+}\}} = \frac{1 \cdot 10^{-14}}{4.2 \cdot 10^{-9}} = 0.238 \cdot 10^{-5} = 2.38 \cdot 10^{-6} \text{ M};$$

Answer: the pH of solution is **8.377** ; $\{OH^{-}\} = 2.38 \cdot 10^{-6} \text{ M}$.