

pH of a solution of a strong acid is 5.0. What will be the pH of the solution obtained after diluting the given solution a 100 times?

$$\text{pH} = 5 \text{ i.e., } [\text{H}^+] = 10^{-5} \text{ mol L}^{-1}$$

On dilution by 100 times $[\text{H}^+] = 10^{-7} \text{ mol L}^{-1}$ For a very dilute solution,

Total $[\text{H}^+] = [\text{H}_3\text{O}^+ \text{ ions from acid}] + [\text{H}_2\text{O}^+ \text{ ions from water}]$

$$= 10^{-7} + 10^{-7}$$

$$\text{pH} = -\log[\text{H}^+] = -\log(2 \times 10^{-7}) = 7 - \log 2$$

$$= 7 - 0.3010 = 6.6990$$